DISSERTATION ON
"ENDOSCOPIC MEDIAL MAXILLECTOMY FOR MAXILLARY SINUS TUMOURS – CLINICAL INDICATIONS AND OUTCOME"

Dissertation submitted in partial fulfillment of the regulations for the award of the degree of

M.S.DEGREE BRANCH IV

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UPGRADED INSTITUTE OF OTORHINOLARYNGOLOGY

MADRAS MEDICAL COLLEGE

CHENNAI – 600003

THE TAMILNADU DR. MGR MEDICAL UNIVERSITY
CHENNAI

APRIL 2015

BONAFIDE CERTIFICATE

This is to certify that this dissertation is a bonafide record of work done by **Dr.A.VIJAYNIVAS**, during his M.S. ENT course from 2012 to 2015 at Upgraded Institute Of Otorhinolaryngology, Madras Medical College, Rajiv Gandhi Government General Hospital, Chennai on **"ENDOSCOPIC MEDIAL MAXILLECTOMY OF MAXILLARY SINUS TUMOURS – CLINICAL INDICATIONS AND OUTCOME"** . He is appearing for his M.S.ENT branch IV degree examination in April 2015 and his work has been done with partial fulfillment of the regulations of The Tamilnadu Dr.M.G.R Medical University, Chennai, Tamilnadu, India.

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CERTIFICATE

This is to certify that this dissertation titled "**ENDOSCOPIC MEDIAL MAXILLECTOMY OF MAXILLARY SINUS TUMOURS – CLINICAL INDICATIONS AND OUTCOME"** been carried out independently and satisfactorily by Dr.VIJAYNIVAS .A , in Institute Of Otorhinolaryngology , Madras Medical College and Rajiv Gandhi General Hospital ,Chennai under my supervision and guidance. All the case studies, results and observations and their interpretation of the thesis has been done by the candidate and periodically checked by me. He is appearing for his M.S.ENT branch IV degree examination in April 2015 and his work has been done with partial fulfillment of the regulations of The Tamilnadu Dr.M.G.R Medical University, Chennai, Tamilnadu, India .

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Dated :

DECLARATION

I, **DR.VIJAYNIVAS. A** , solemnly declare that this dissertation entitled **"ENDOSCOPIC MEDIAL MAXILLECTOMY OF MAXILLARY SINUS TUMOURS – CLINICAL INDICATIONS AND OUTCOME"** is a bonafide work done by me in Upgrade Institute Of Otorhinolaryngology, Madras Medical College and Rajiv Gandhi General Hospital , Chennai during the period of 2012 to 2015 under the guidance of **Prof. Dr. G. SELVARAJAN M.S.D.L.O.,** Professor , Institute Of Otorhinolaryngology, Madras Medical College and Rajiv Gandhi General Hospital ,Chennai – 3 and submitted to The Tamilnadu Dr. MGR Medical University, Guindy, Chennai – 32 in the partial fulfillment of the regulations for the award of the M.S.E.N.T ., (Branch IV)

(Dr. A.Vijaynivas.A)

Place :Chennai,
Date :

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TABLE OF CONTENTS

INTRODUCTION

Nose occupies a functionally vital, cosmetically pleasing and anatomically central position in the human face. Benign and malignant tumors of nose and paranasal sinuses, although rare according to statistics, are a very important group for a head and neck surgeon. Tumors of nasal cavity and sinuses account for 0.2-0.8% of all carcinomas. These tumors show a great diversity in their presentation, clinical features, histology and treatment options. Tumors often simulate symptoms of chronic sinusitis and other chronic inflammatory diseases, with a resultant delay in diagnosis.

A high proportion of these tumors are locally advanced involving the bony structures of the upper jaw and base of skull in addition to soft tissues of orbit, face and oral cavity. By the time lesions attain sufficient size to evolve symptoms; it may be impossible to ascertain its site of origin. Fortunately, despite the fact that majority of the patients have advanced disease at presentation, propensity for distant metastasis is rare. Better imaging techniques, nasal endoscopy delineate the tumor precisely and help in better management.

In order to achieve tumor ablation, the tumor should be mapped accurately in the preoperative stage. In achieving this, clinical and radiological examinations complement each other. The wide variability of surgical and radio therapeutic techniques, duration of follow up, methods of reporting survival, and absence of accurate staging system until recently have all made the management of these tumours difficult. The diagnosis and management in patients of sinonasal malignancies has been shown to improve in the last three decades, with the advent of endoscopes and consequently, quality of life have improved to much extent.

AIMS AND OBJECTIVES OF THE STUDY

1) To evaluate the role of endoscopic medial maxillectomy for benign and malignant maxillary sinus tumours

   a. To evaluate the tumours, those that are amenable to endoscopic medial maxillectomy.

   b. To study the various techniques and the modifications in endoscopic medial maxillectomy.

2) To assess the disease clearance, post operative healing status , recurrence, complications and benefits of the procedure.

3) To study the role of extended medial maxillectomy in tumours extending to adjacent sinuses.

ANATOMY OF LATERAL NASAL WALL

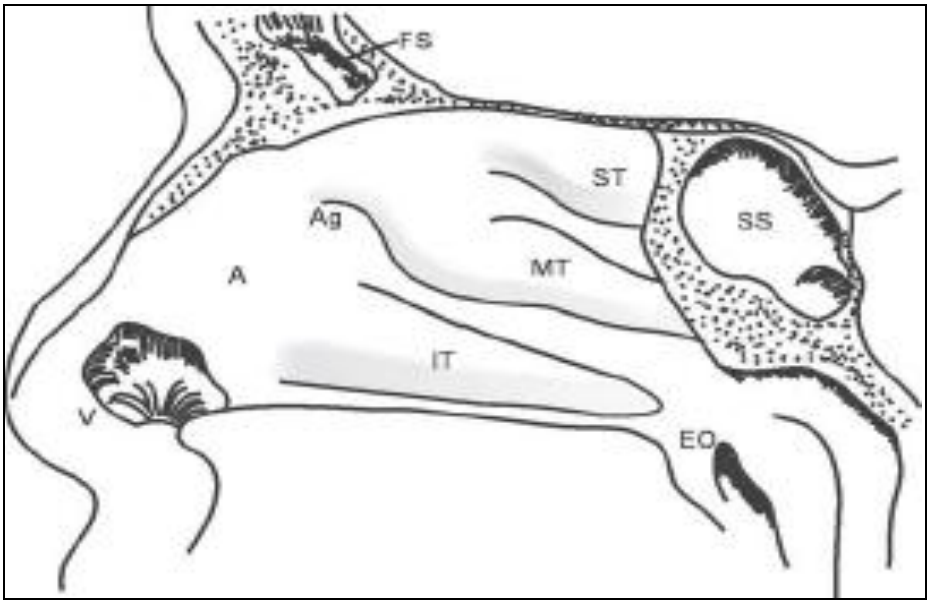
GENERAL OBSERVATIONS

The ethmoid bone, the maxilla, the palatine bone, the lacrimal bone, the inferior concha and medial surface of the medial pterygoid plate all contribute to the formation of the lateral nasal wall.

In the anterior area of nostril, lateral nasal wall is lined by skin and has hair; this is the vestibule .Behind this is a plain structure less area lined by nasal mucosa called the atrium. The atrium shows a bulge anterior to the middle turbinate formed by the underlying agger nasi cell. This ridge overlies the nasolacrimal duct. Behind the atrium are the three scrolls of the inferior, middle and superior turbinate, overlying the respective meatii. Occasionally, there may be a supreme turbinate. Above the superior turbinate is the sphenoethmoidal recess, which forms a niche between the posterior ethmoid cells and the sphenoid sinus.

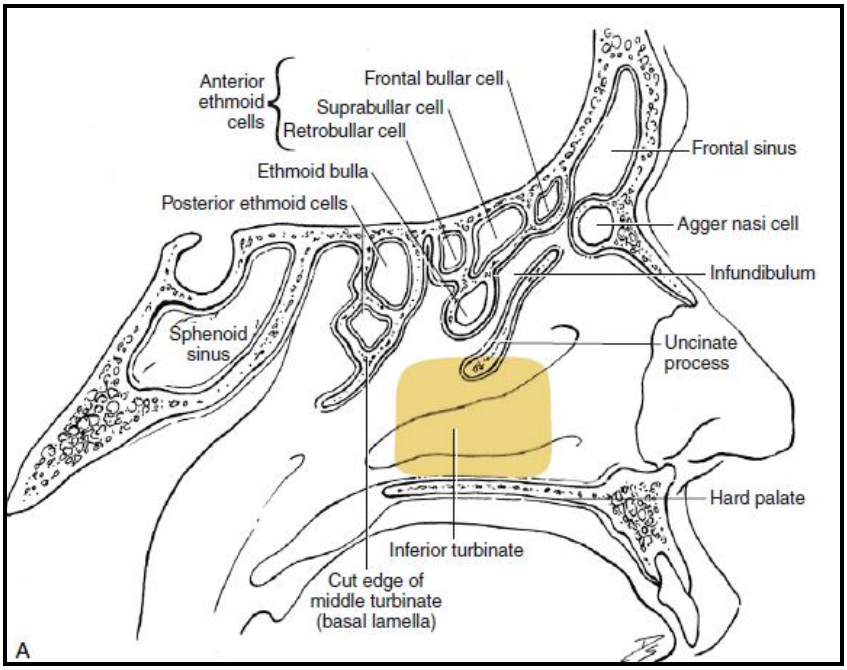
The inferior turbinate is fairly straight and structureless as compared to the middle turbinate, which is convoluted showing many features and anatomical variations. The posterior end of the middle turbinate ends at the level of the roof of the posterior

choana. The eustachian tube lies in the nasopharynx at the level of the inferior turbinate 1 cm behind its posterior attachment. The fossa of Rosenmuller forms a deep cleft behind the torus tubaris.



v-vestibule, a-atrium,ag – aggar nasi cells, it – inferior tirbinate, mt – middle turbinate, st – superior turbinate, eo – eustachian orifice, ss – sphenoid sinus

The base skull sloping downwards from an anterior to posterior direction at an angle of 15°. The olfactory nerves can be seen perforating the cribriform plate. The frontal sinus is seen between the two tables of the frontal bone



The middle turbinate is a convoluted structure bending in different planes similar to a dried leaf. It can be divided into three parts, depending on its attachment and its orientation in the three-dimensional space.

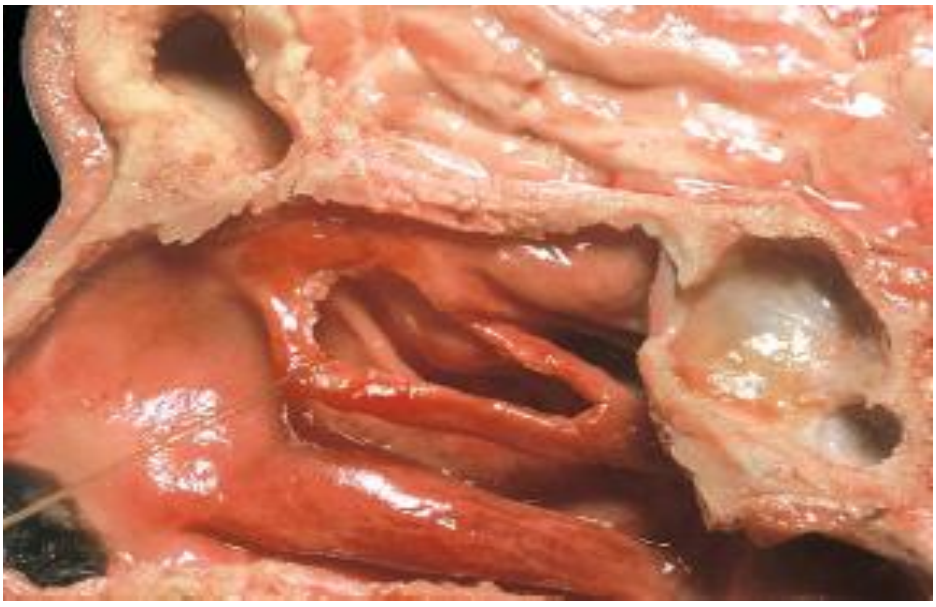
The anterior one-third is in the sagittal plane and is attached to the cribriform plate at the junction of the medial and lateral lamellae. It also takes a small anterior attachment to the frontonasal process of the maxilla.

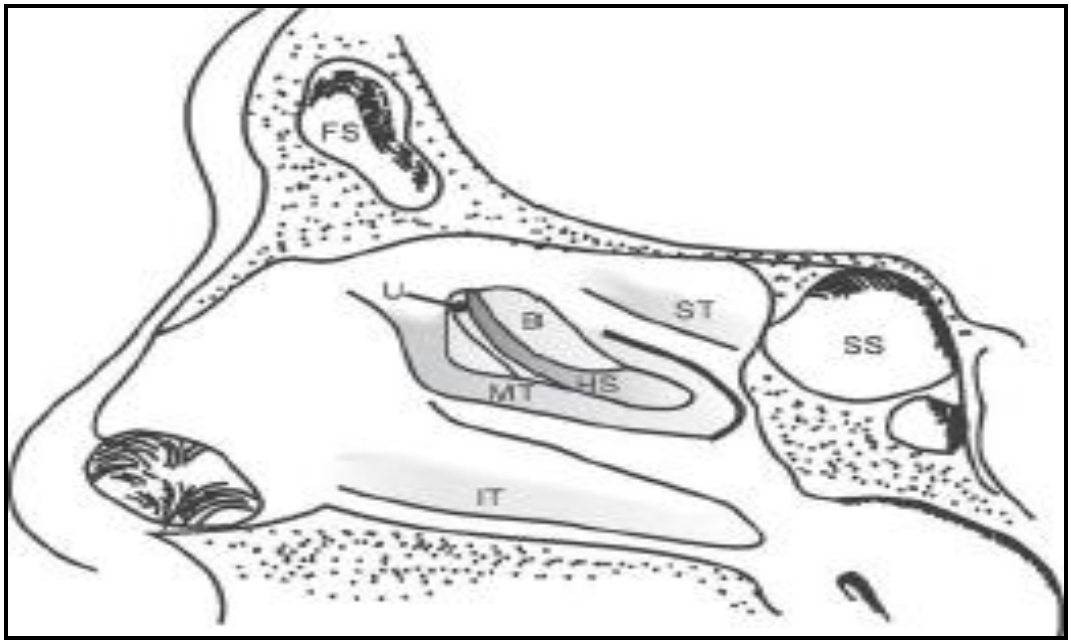
The middle one-third lies in the coronal plane and is attached to the lamina papyracea. It separates the anterior ethmoidal cells from the posterior ethmoidal cells. Since it stabilizes the middle turbinate, it is called the ground lamella or the basal lamella.

The posterior third lies in the horizontal plane and is attached to the lamina papyracea and the palatine bone perpendicular plate extending upto roof of posterior choana.

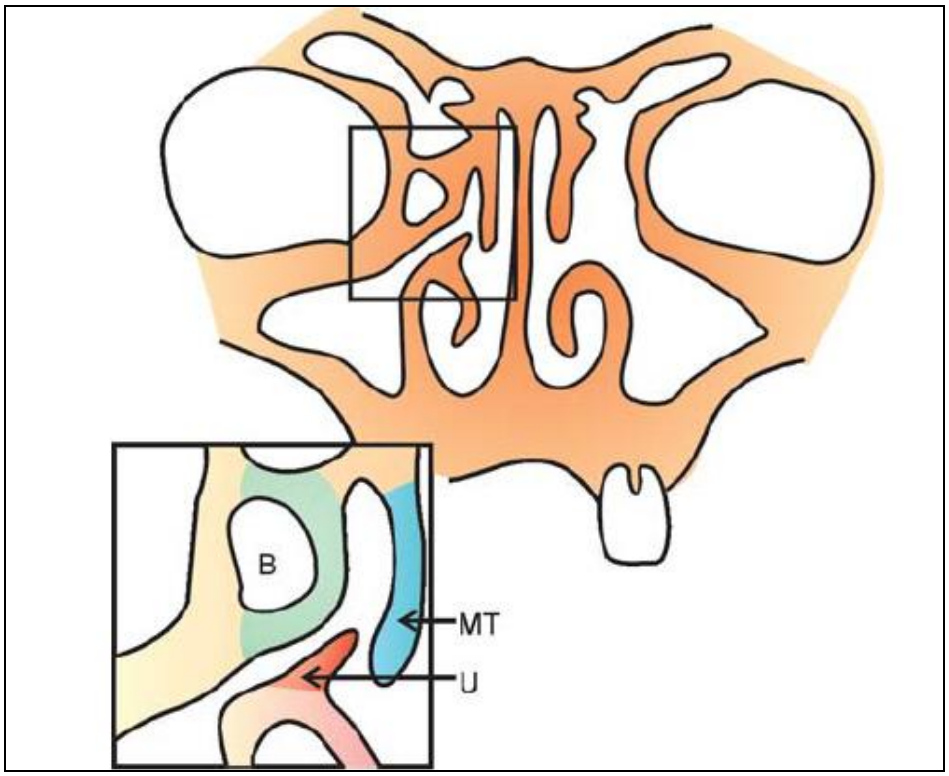
Most anteriorly is a curved ridge called the uncinate process. Behind this is the well pneumatized and most constant anterior ethmoidal cell, namely the ethmoidal bulla. These structures are separated by a semilunar groove called the hiatus semilunaris. The hiatus semilunaris is two-dimensional and leads into a three-dimensional space called the infundibulum. The uncinate process, the bulla and the intervening infundibulum form the key area or the osteomeatal unit into which the frontal, the maxillary and anterior ethmoidal sinuses drain.

THE OSTEOMEATAL UNIT

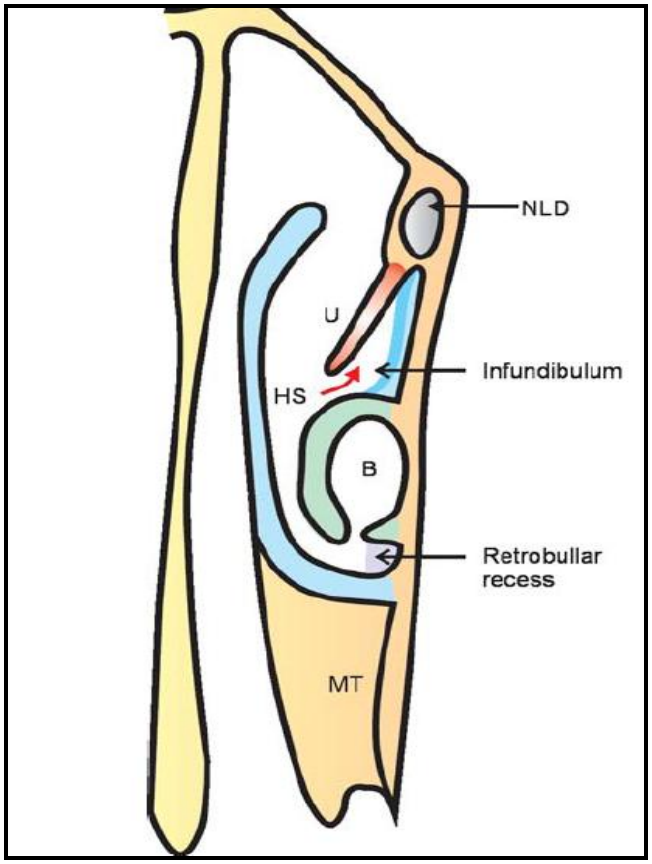




U –uncinate , b – bulla , hs – hiatus semilunaris



Coronal section through osteomeatal unit



Axial section through osteomeatal unit

Occasionally the bulla does not extend upto the base of the skull and is separated from it by the suprabullar recess. The retrobullar and suprabullar recesses together form a semilunar space above and behind the bulla called the Sinus Lateralis of Grunwald. The roof of the sinus lateralis is formed by the ethmoid fovea and its floor by the ethmoidal bulla. It is limited posteriorly by the ground lamella of the middle turbinate and anteriorly it opens into the frontal recess. Laterally is the lamina papyracea and medially is the middle turbinate.

The infundibulum leads directly or indirectly into the frontal recess.

- The frontal recess is bounded anteriorly by the agger nasi cell, which is considered to be a part of the frontal recess. Therefore the anterior wall of the frontal recess is formed by the agger nasi cell.

- The posterior wall is formed by the bulla ethmoidalis. If there is a suprabullar recess it will open into the posterior wall of the frontal recess.

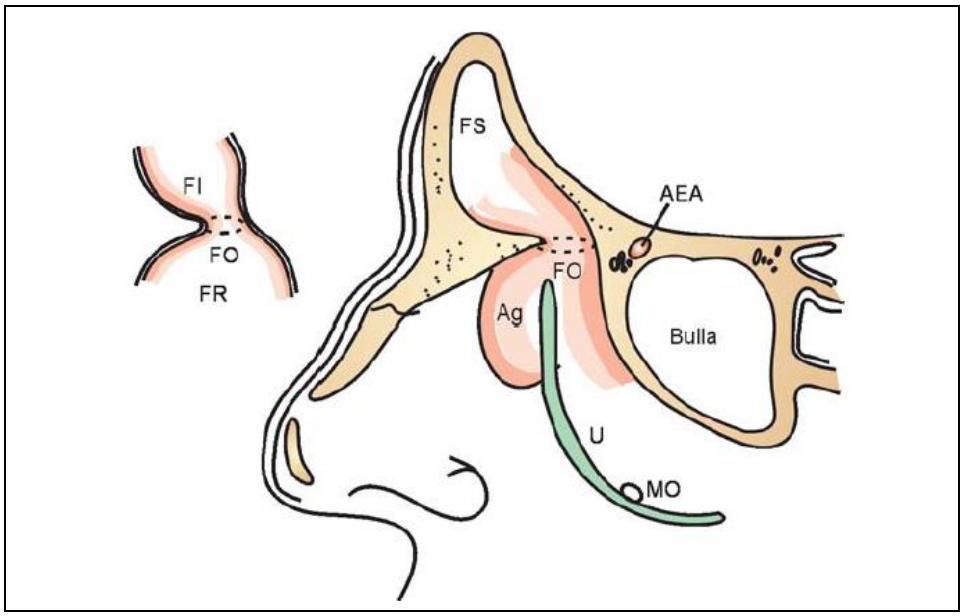
- The lateral wall of the frontal recess is formed by the lamina papyracea.

- The medial wall is formed by the middle turbinate.

- Superiorly the frontal recess opens via the frontal ostium into the frontal sinus. Seen from above the frontal sinus opening is funnel shaped and is placed at the posterior and medial end of the floor of the frontal sinus.

This funnel shaped region is called the frontal infundibulum. Thus in sagittal cross-section the frontal infundibulum, frontal

ostium and the frontal recess together form the “hour-glass configuration” so often described.



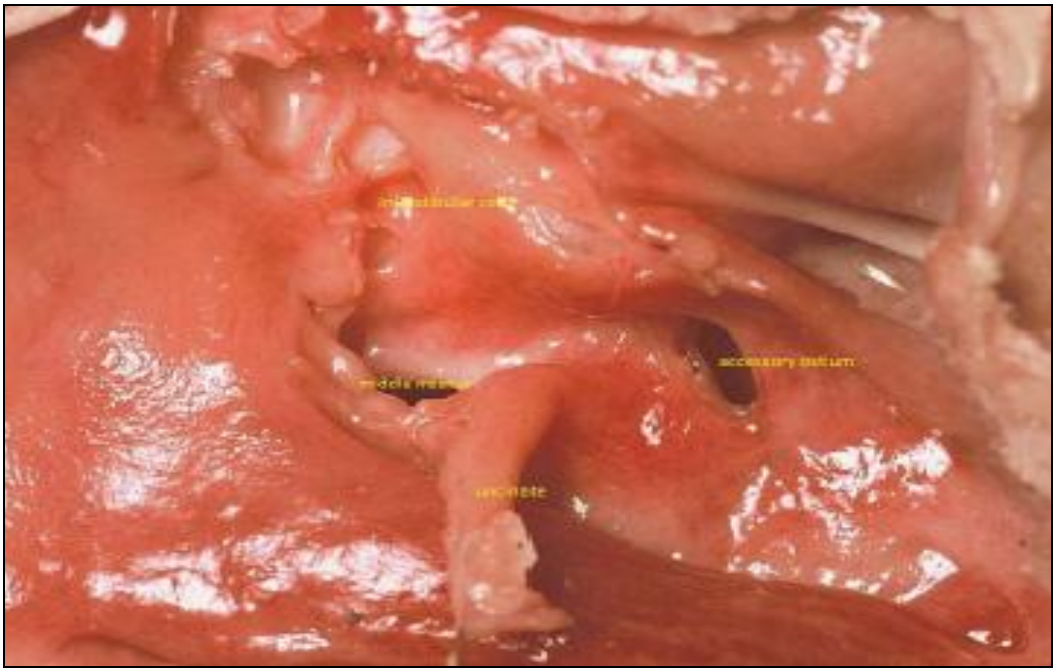
Representation of frontal recess- hour glass configuration

The upper end of the uncinate process lies within the frontal recess. It shows great variation in anatomy. It can

- ❖ Extend upto the base skull.
- ❖ Attach to the middle turbinate.
- ❖ May turn forwards to be attached to the insertion of the middle turbinate.
- ❖ Lie free in the middle meatus.
- ❖ May be pneumatized.

Most commonly (80%) it attaches to the lamina papyracea in the form of a dome. The recess, which is enclosed within this dome, is called the recessus terminalis . Frontal sinus may open medial to uncinate process in these cases.

Infundibulum can be exposed by resecting the uncinate .In the depths of the infundibulum, well hidden by the uncinate process lies the opening of the maxillary sinus. The normal ostium of the maxillary sinus is usually ovoid and tunnel like, having three-dimensions. Conversely the accessory ostium is easily seen, usually circular and has only two dimensions.

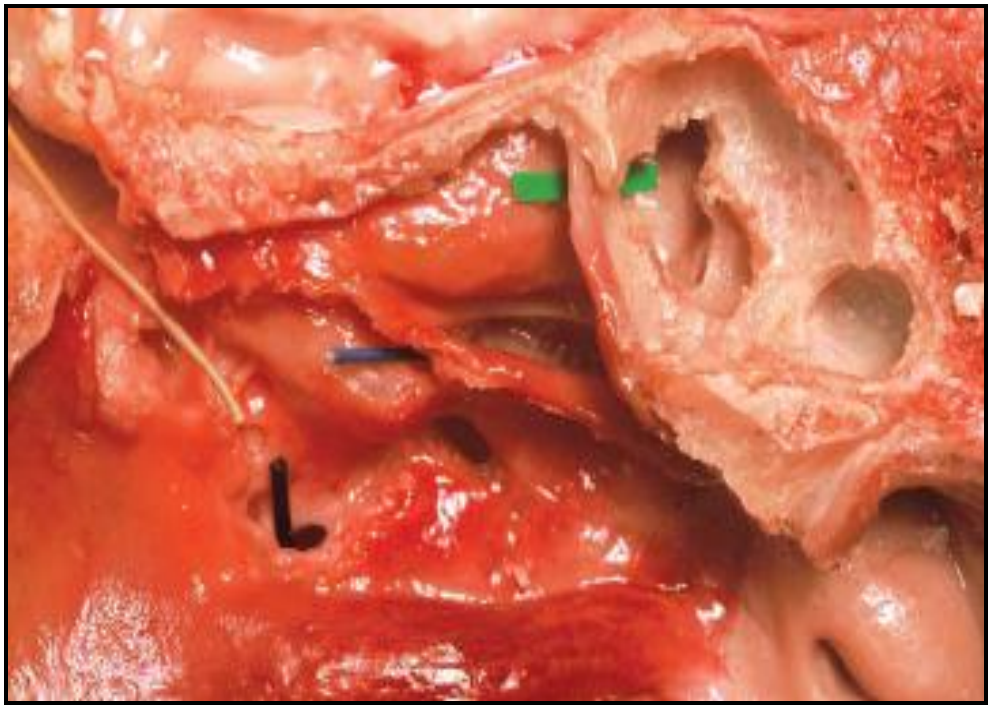


Uncinate is cut revealing the infundibulum, the maxillary ostium, the accessory ostium

The relations of the maxillary ostium are:

- Inferiorly is the inferior turbinate,
- 1 to 2 mm superiorly is the lamina papyracea and the orbit,
- Posteriorly is the posterior fontanelle,
- 0.5 cm anteriorly lies the nasolacrimal duct.

The anterior fontanelle, an area of double layer of mucosa without any underlying bone, is found anteroinferior to the uncinate process .Similarly; the posterior fontanelle lies posterior and little above the posterior attachment of the uncinate process. The mucosa in these fontanelles may be dehiscent to produce accessory ostia. The frontal recess, the maxillary sinus and the opening of the bulla into the middle meatus are visualized. The bulla may drain into the middle meatus, the hiatus semilunaris inferioris or into the sinus lateralis when present. The frontal sinus drains into the frontal recess either medial or lateral to the uncinate process depending on the mode of attachment of the uncinate process. It may also drain into the suprabullar recess when it is present. The maxillary sinus shows no variation in drainage and always drains into the infundibulum. The sphenoid sinus drains into the sphenoethmoidal recess.



Drainage of: (1) maxillary sinus (black), (2) bulla (blue),(3) frontal sinus (light brown), (4) sphenoid sinus (green)

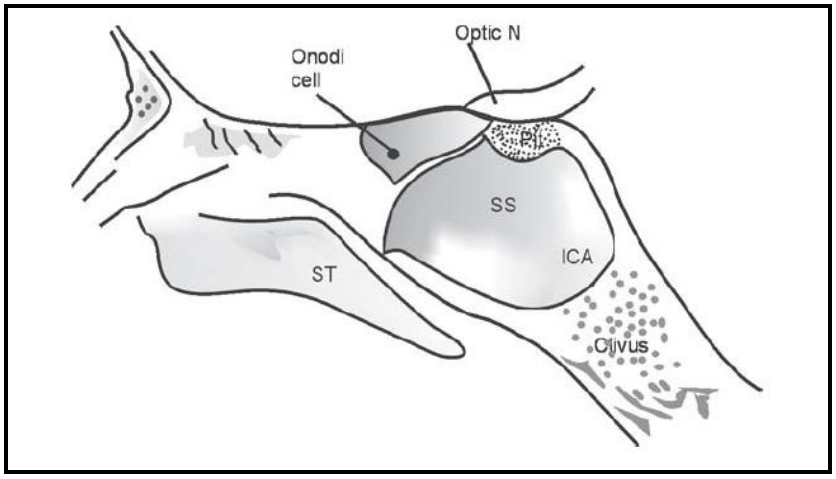
The anterior and posterior ethmoid cells are now dissected taking care to leave the anterior wall of the bulla and the ground lamella of the middle turbinate intact .There are four barriers, these from anterior to posterior are

- The uncinate
- The anterior wall of the bulla,
- The ground lamella and the anterior wall of the sphenoid.

The sphenoid sinus ostium lies high on its anterior wall close to its roof. It drains into the sphenoethmoidal recess. The superior

turbinate in the spheno-ethmoidal recess, may over lie the opening of the sphenoid ostium .

The sphenoid ostium lies 1-1.5 cm above the roof of the posterior choana and approximately 2-3 mm away from the septum. One of the most important anatomical relationships is the relationship of the posterior ethmoid cells to the sphenoid sinus. In a sagittal section, the posterior ethmoidal cells can be seen extending for a short distance over the sphenoid sinus. They also lie in the lateral nasal wall compared to the sphenoid, which lies in the midline. The well-pneumatized sphenoid sinus extends posteriorly upto the clivus. Thus, the sphenoid sinus lies posterior, inferior and medial to the posterior ethmoid cells . In 10 percent cases a posterior ethmoidal cell may extend posterolaterally over the sphenoid sinus for a much longer distance . This cell is then called the Onodi cell. Thus the Onodi cell when present insinuates itself between the optic nerve and the sphenoid sinus. The optic nerve therefore produces a bulge in the Onodi cell instead of in the sphenoid sinus. Below is the relation of onodi cell with optic nerve and internal carotid artery.



The ethmoidal cells have been completely cleared to expose the lamina papyracea, which appears yellowish due to the underlying orbital fat . The maxillary ostium has been widened to gain a view of the interior of the sinus. It can be seen that the lamina papyracea and consequently the orbit is just 2-3 mm above the level of the maxillary ostium. The inferior turbinate has been trimmed. It overlies a smooth fairly structureless inferior meatus. Although the inferior turbinate is fairly straight, its attachment shows a peak or apex approximately 1 cm behind its anterior end .The nasolacrimal duct opens in the roof of the inferior meatus at this apex. It is guarded by a valve called the Hasner's valve. The canal for the nasolacrimal duct has been dissected. It lies approximately 5 mm anterior to the normal maxillary ostium. The nasolacrimal duct is split open to visualize the lacrimal sac, the duct and the Hasner's valve.

BLOOD SUPPLY OF THE NOSE:

1) Anterior ethmoid and posterior ethmoid artery –branch of ophthalmic artery – supplies ethmoid and frontal sinus, roof of nose, upper part of lateral wall of septum.

2) Sphenopalatine artery – branch of maxillary artery – supplies the mucosa of the superior and middle meatus , concha and septum.

3) Greater palatine artery – branch of maxillary artery -Posterior part of the lateral wall nasal cavity as it decends down the greater palatine canal . Anterior inferior end of septum as it re-enters the nose through the incisive canal.

4) Superior labial artery – br. Of the facial artery – supplies the vestibule of the nose.

5) Infra orbital, posterior superior alveolar and anterior superior alveolar artery – branch of maxillary artery – mucous membrane of maxillary sinus.

6) Pharyngeal branch – maxillary artery –sphenoid sinus

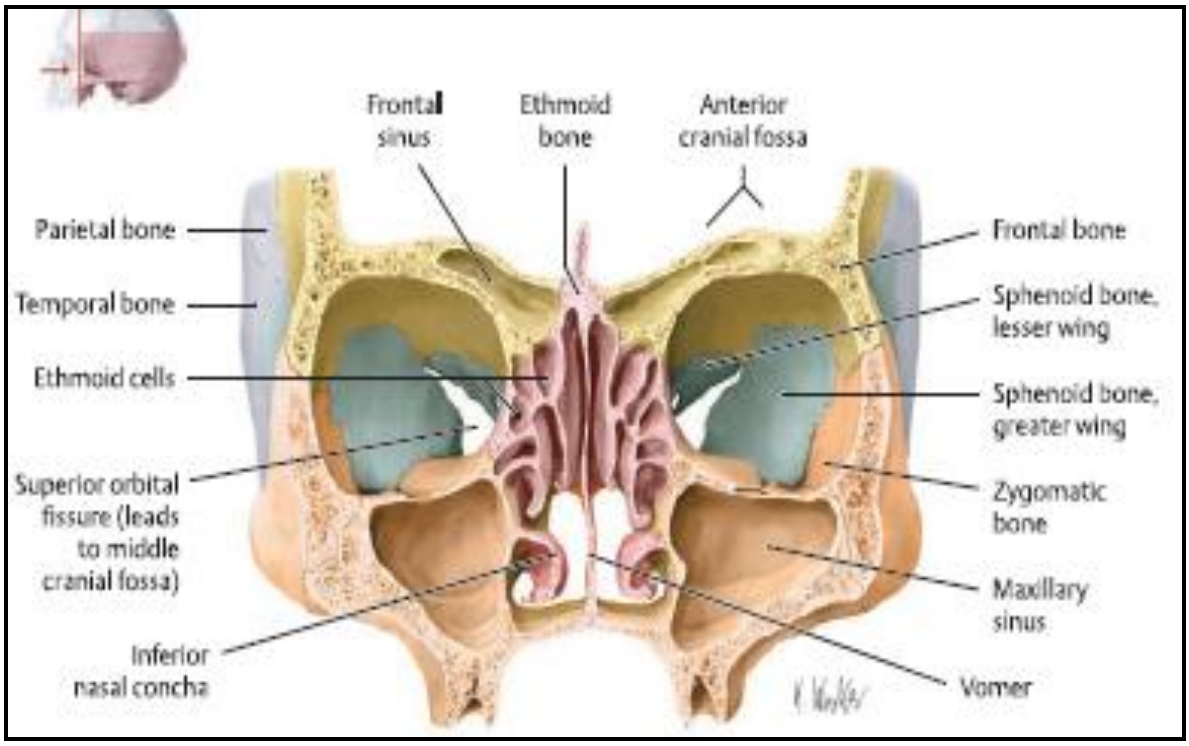
7) Twigs of the internal carotid artery – sphenoid sinus.

MAXILLARY SINUS

Maxillary sinus measures approximately seven mm in the anteroposterior depth, four mm in height, and two point seven mm in width at birth. The maxillary sinus pneumatise continuously between ages one and eight years of age,the sinus extends laterally beyond the infraorbital canal, and inferiorly extends to the mid portion of meatus. At the age of sixteen, the maxillary sinus reaches the adult dimensionof thirty nine mm in depth,thirty six mm in height, and twenty seven mm in width.

The volume of adult maxillary sinus is fifteen ml and is usually a single pyramidal chamber. The inferior turbinate, uncinate process, perpendicular plate of the palatine bone, and the lacrimal bone form the medial wall of maxillary sinus. The measurement of maxillary sinus ostium is 3 to 4 mm in diameter and lies in an anteromedial position .the sinus extends laterally into zygoma.orbital floor forms the roof of maxillary sinus . The infraorbital nerve forms a ridge along the roof of sinus in a posterior to anterior direction. Aveolar process and palatine process of maxilla forms the floor of the maxillary sinus. The infraorbital foramen located at the midsuperior portion lies in the anterior wall of the maxilla. The canine fossa is located just above

the canine tooth. The anterior border of the pterygomaxillary fossa is formed by the posterior wall of the maxillary sinus , which consists of the internal maxillary artery, vidian nerve, sphenopalatine ganglion, the 2nd branch of the trigeminal nerve and the greater palatine nerve.



Innervation

The sensation of the maxillary sinus is supplied by posterior superior alveolar nerve . The anterior portion of the maxillary sinus is supplied by anterior superior alveolar nerve. Greater palatine nerve supplies the maxillary ostium through the infundibulum is innervated by the anterior ethmoidal branch of trigeminal nerve V1.Secretomotor fibers of the seventh nerve

originate from nervus intermedius, synapse at pterygopalatine ganglion, and is carried to the sinus mucosa with trigeminal nerve sensory branches.

Lymphatic

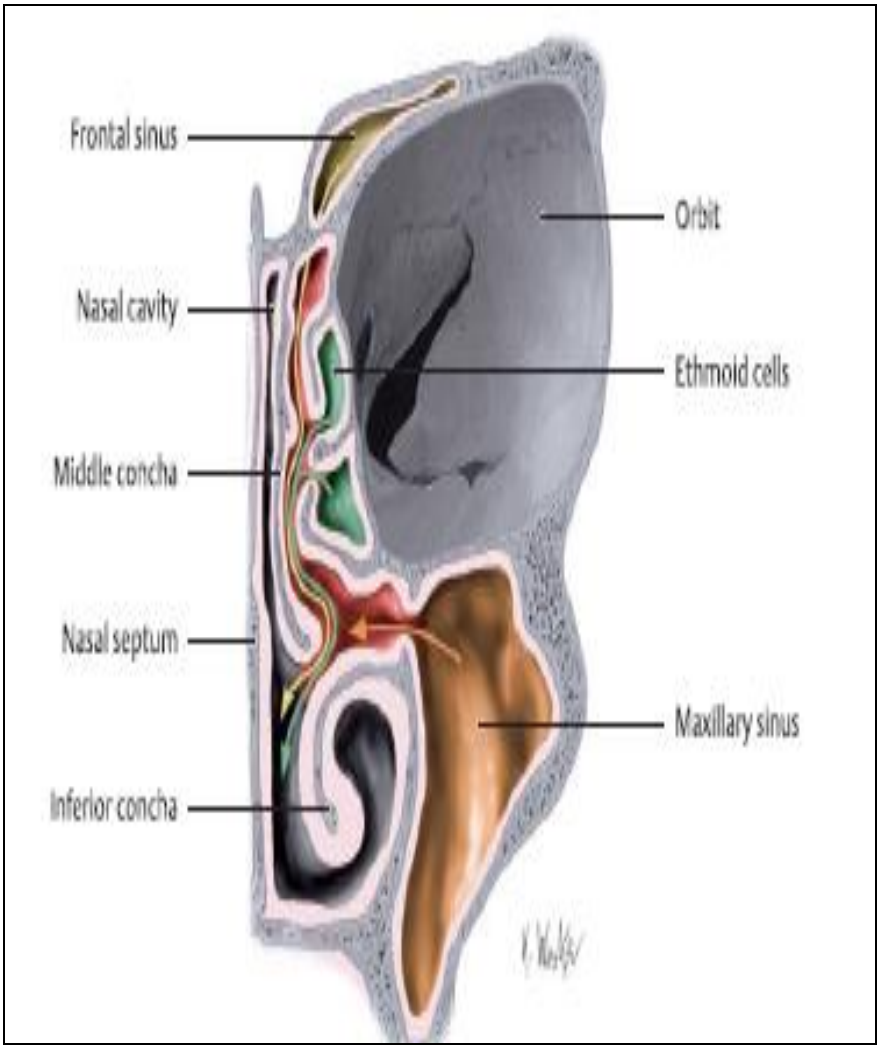
The maxillary sinus mucosa has both superficial and deep lymphatics draining towards the natural ostium. The number of lymphatic channels increase from above below, and from posterior to anterior, with maximum density near the natural ostium. Here, the lymphatic network connects the nasal vessel to the nasopharynx. In addition , lymphatic connections are seen close to pterygopalatine plexus to Eustachian tube and nasopharynx. The main lymphatic drainage of the paranasal sinuses are the lateral cervical and retropharyngeal lymph nodes.

Vascular Supply

The arterial supply of the maxillary sinus are the infraorbital and lateral branches of the sphenopalatine artery , the greater palatine, and the alveolar arteries. Venous drainage of the maxillary sinus is the facial vein and the maxillary vein draining into the jugular and dural venous sinus systems.

Mucociliary Function

The cilia present in the maxillary sinus push the mucus from the floor of the maxillary sinus towards the ostium. From the ostium, mucus is propelled superiorly to the ethmoid infundibulum. The mucus is the swept below the ethmoidal bulla and through the middle meatus,anteriorly towards the torus tubarius into nasopharynx, from where it is then swallowed.



REVIEW OF LITERATURE

HISTORICAL ASPECTS

Tumors of nose and paranasal sinuses have been known since the time of HIPPOCRATES and were grouped into hard and soft types with the belief that they shorten the lifespan of the person.

Up to 1825, surgery of maxillary cancer consisted largely of as much piece removal as could be tolerated .

In 1827 JOHN LIZARS of Edinburg first attempted en bloc Maxillectomy.

In 1829 SYME was the first to perform the procedure successfully.

FERGUSSON'S description of the classic (WEBER-FERGUSSON) incision in 1845 was the benchmark in the development of access to the sinuses.

MOURE introduced lateral rhinotomy in 1902. SIBILEAU first attempted to classify maxillary cancers in 1906.

In 1920 BERVEN and HOLMGREEN developed a combined radiologic and electrosurgical method for the treatment of malignant maxillary sinus tumors.

OHNGREN in 1933 divided the antrum into anteroinferior and posterosuperior quadrants attaching prognostic values to them.In 1975 JATIN P SHAH and GALICICH J. H, strongly recommended the use of bifrontal craniotomy approach among the craniofacial resection techniques for frontal tumors which extend to the anterior cranial fossa .

In 1977, SESSIONS et al coined and described the term medial maxillectomy.

A study was conducted by Tufano, Ralph P, Mokadam, Nahush , Montone, Kathleen ,in order to determine the spectrum of disease and outcome after treatment. The medical records of 48 patients with sinonasal malignancies treated between 1990-1997 were reviewed. Multiple sites of origin were common, including maxillary (83%), ethmoid (35%), nasal cavity (40%).The histological spectrum showed squamous cell carcinoma (46%),adenoid cystic carcinoma(6%) and others (48%). Treatment included surgery and adjuvant radiotherapy (58%), surgery alone (27%),adjuvant adiotherapy and chemotherapy (6%),surgery and chemotherapy(4%) and adjuvant radiotherapy alone(4%). The experience revealed surgery and adjuvant radiotherapy to be the

modality of choice particularly for advanced tumors, whereas surgery alone may be sufficient for small localized cancers.

A study was conducted by Harbo P, Grau C, Bundgaard T, Overgaard M from 1963- 1991. A total of 277 consecutive patients with cancers of Nose and Paranasal sinuses treated at Aarhus hospital were selected. The major histological types included squamous cell carcinoma(46%),lymphoma(14%), adenocarcinoma (13%) and malignant melanoma(9%).

Indian journal of otorhinolaryngology head and neck surgery july 2013 edn;

Endoscopic medial maxillectomy breaking new frontiers by Dr. Sanjeev Mohanty and M.Gopinath. nine patients were managed by endoscopic medial maxillectomy . Histopathology revealed five patients with inverted papilloma, two patients with invasive fungal sinusitis and one patient with fibrous dysplasia and one patient with Rosai – Dorfman disease. All the patients were followed for two years. One patient with invasive fungal sinusitis had recurrence was taken up for total maxillectomy others there was no recurrence.

Laryngoscope. 2003 Apr Trans nasal endoscopic medial maxillectomy for inverting papilloma by Sadeghi N, Al Dhahri S, Manoukian JJ

Here transnasal endoscopic medial maxillectomy was compared open methods for scope of resection of tumour, margin control, operative time and surgical access. They concluded that strong illumination, superior resolution , and angled visualization coupled with exact osteotomies make trans nasal endoscopic medial maxillectomy an effective technique

Arch otorhinolaryngology head and neck surgery vol. 332 nov 2007 ,

Transnasal endoscopic medial maxillectomy as the initial oncologic approach to sinonasal neoplasm, by Neil Tanna , John D Edwards MD, Hamid Aghdam MSc, Nadar Sadeghi MD. Here they analyzed that doing transnasal endoscopic medial maxillectomy complete resection of the mass in the maxillary sinus can be done. Also using the procedure the adjacent areas such as floor of the orbit, pterygopalatine fossa, nasopharynx anterior skull base can be accessed. in advanced squamous cell cancers of maxillary sinuses7

A study was conducted by Desiderio Passali, Bruno de capau, Albertina de lauretis on 36 patients with advanced squamous cell carcinoma. There were 16 T3 and 20 T4 stage cases. Treatment consisted of radiotherapy alone in 21 cases and radiotherapy followed by chemotherapy in 15 cases. The median survival for all

analyzed patients was 19 months .The 3- year and 5-year survival were 30% and 17% respectively. The respective 3- and 5- year survival probabilities were 19% and 9% for patients treated with radiotherapy alone and 40% and 27% for patients treated with radiotherapy and chemotherapy. The findings seem to suggest that the addition of systemic chemotherapy to radiotherapy may improve overall survival

SINONASAL TUMOURS

EPIDEMIOLOGY OF SINONASAL CANCERS

The incidence of Sinonasal malignancies is 0.5-1% per year, which accounts for 0.2-0.8% of all malignancies . Up to 44% of sinonasal neoplasms are attributed to occupational exposure. Male: Female ratio 2:1. Mean age of sinonasal cancers is 55 years.

ETIOLOGY OF SINONASAL CANCERS

- Hard wood dust (Adenocarcinoma)
- Soft wood dust (Squamous cell carcinoma)
- Nickel refining, chromium workers
- Shoe and textile workers
- Isopropyl oil, volatile hydrocarbons
- Snuff

HISTOPATHOLOGICAL CLASSIFICATION

Benign Tumors

- Papilloma
- Osteoma
- Chondroma

- Fibrous dysplasia
- Haemangioma
- Leiomyoma
- Schwannoma

Intermediate Tumors

- Inverted papilloma
- Cylindric cell papilloma
- Haemagiopericytoma
- Meningioma
- oncocytoma

Malignant Tumors

- Undifferentiated carcinoma
- Basal cell carcinoma
- Squamous cell carcinoma
- Adenocarcinoma
- Malignant melanoma

- Olfactory neuroblastoma
- Sarcomas
- Malignant neurogenous tumors

OHNGREN S LINE

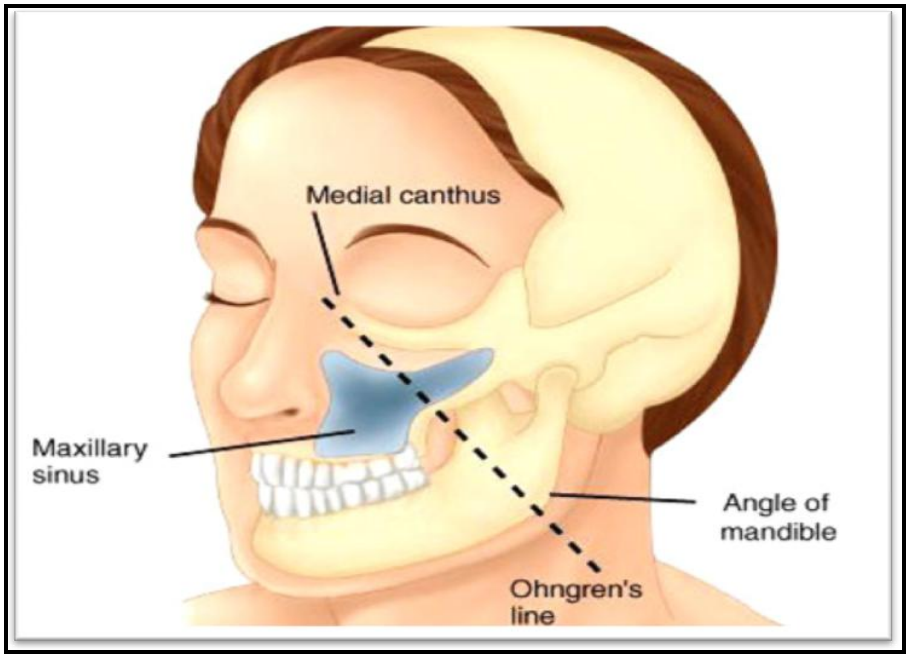
Ohngren line is an imaginary line running from the medial canthus of the eye to the angle of the mandible.

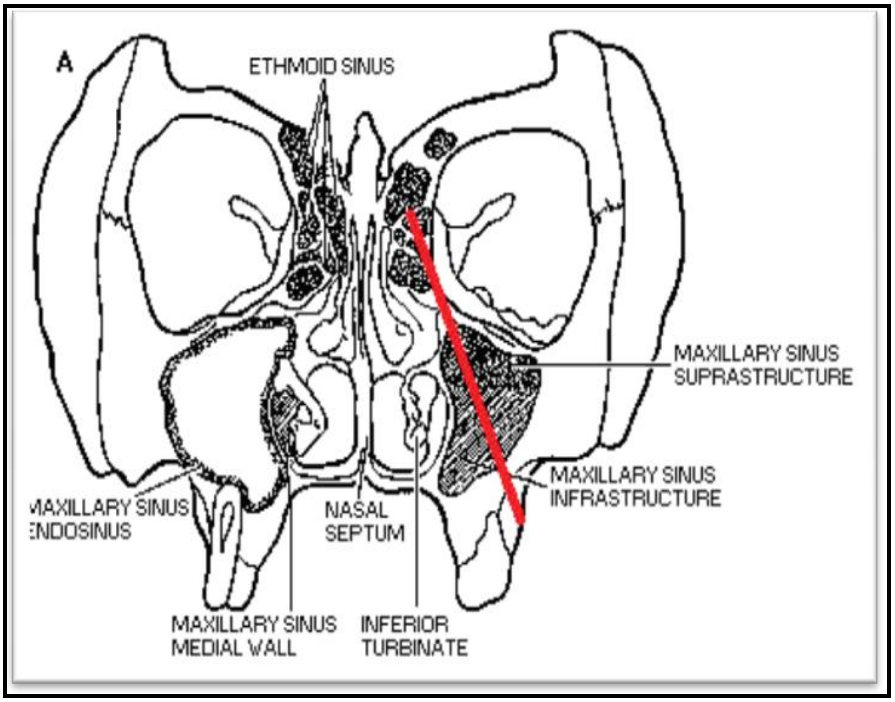
This line was used to separate the tumours in to two groups as – tumours that arise above the line and the tumours the arise below the line.

Ohngren suggested the tumours that arise above the line (supra structure) are poorly differentiated, aggressive with very poor prognosis. Whereas the tumour that arise from below the line (infrastructure) were respond well to treatment and have better prognosis.

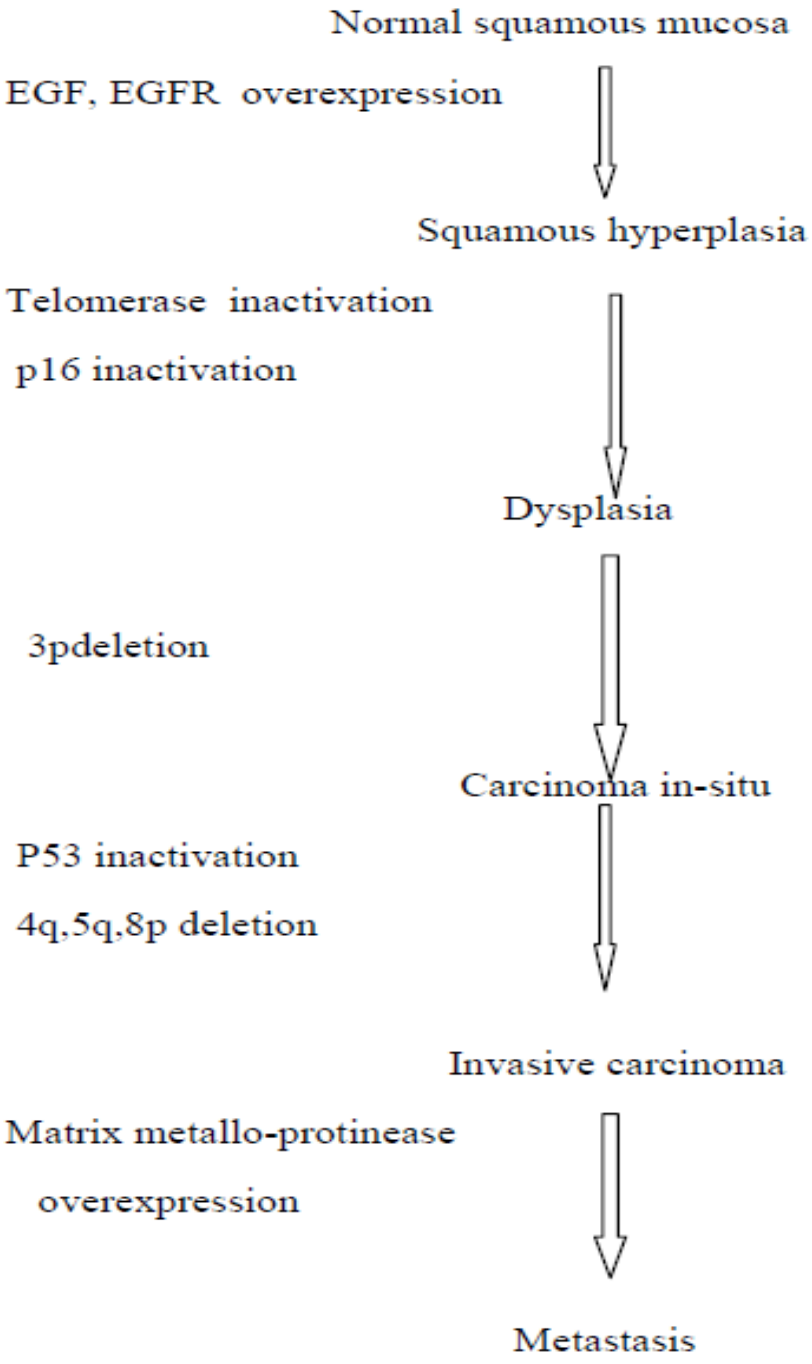
The classification is now only of historical value as it was described before the practice of craniofacial dissection, also with the advances in the radiation oncology most of the tumours are now amenable to combined modality of treatment.

From the image below it is clear that the tumours from the infrastructure are well amenable to endoscopic medial maxillectomy





PATHOLOGY


Normal squamous mucosa
EGF, EGFR overexpression
Squamous hyperplasia
Telomerase inactivation
p16 inactivation
Dysplasia
3pdeletion
Carcinoma in-situ
P53 inactivation
4q,5q,8p deletion
Invasive carcinoma
Matrix metallo-protinease
overexpression
Metastasis

BENIGN TUMOURS

Osteoma

Is a benign osteogenic tumour containing mature bone. Found commonly in the mandible, also seen in the maxilla and in the fronto ethmoidal sinus. Often associated with gardner s syndrome – comprising of osteomas, soft tissue tumours , intestinal polyposis.

Chondromas

Chondromas develop anywhere in the nose and sinuses. Difference between benign and malignant is difficult to predict. Tumours eventually become malignant.

Fibrous dysplasia

It has a female preponderance. Often diagnosed in the childhood and it ceases to grow after puberty. It presents as a painless slow growing swelling typically of the maxilla and progress to deformity.

Ossifying fibroma

It is a variant of fibrous dysplasia , occurs commonly in jaws ,maxilla , closely related to cementoblastoma. It presents as a painless swelling. There is an equal incidence in male and female with peak age incidence in the third and fourth decade.

Hemangioma

Very often occurs in the septum, but also reported in frontalbone, maxilla and nasal bones. Cavernous hemangioma is the commonest with propensity to recur even after excision. Occur commonly in females of age 20 to 50 years.

Leiomyoma

Very rare, only 20 cases have been described in literature.

Schwannoma

Account for 4 % of all the peripheral nerve tumours. Occur from 12 years upto 8 th decade.may simulate large number of nasal masses with massive lesions and bony erosion.

Cylindrical Cell Papilloma

This is an unusal tumour of the maxillary antrum and the lateral wall. On naked eye examination they appear granular. Malignancy transformation is similar to inverted papilloma.

Inverted Papilloma

Papillomas are bulky, firm, red and vascular masses usually in one side of the nose. Inverted papilloma shows patterns of inversion covered by squamous or transitional epithelium. Commonly involves maxillary sinus, ethmoid, frontal sinuses. Synchronous malignancy is common upto 15%.

MALIGNANT TUMOURS

Squamous cell carcinoma

Squamous Cell Carcinoma (SCC) is the most common sinonasal malignancy. The highest incidence is in the seventh decade of life and there is a male preponderance. Most SCC arise from the lateral wall of the nasal cavity with 50 percent developing on the turbinates. Two-thirds of septal SCC are found anteriorly in the region of the mucocutaneous junction. Transformation of Schneiderian papillomas into SCC is a recognized risk.

Adenocarcinoma

These account for 9 % of sinonasal malignancies with a predilection to the male gender and tend to occur between the sixth and seventh decade of life. It commonly occur in upper nasal cavity and ethmoid sinuses. Worse prognosis is for sessile and mucoid types.

Adenoid cystic carcinoma

Account for <5% of sinonasal malignancies. As other areas of the body the tumour tends to grow slowly with perineural and vascular spread. All the variants of the tumour may occur. Most commonly affected site is maxillary sinus and usual presentation is

long duration of facial pain that was not diagnosed for many months to years.

Olfactory neuroblastoma (aesthesioneuroblastoma)

Also known as esthesioblastoma . Originating from basal cells of olfactory neuroepithelium with a representation of < 5% of sinonasal malignancies. Bimodal presentation with peak incidence at 20years and 50 years of age has been observed. Standing apart from other sinonasal malignancies there appears to be a greater incidence in women.

Sinonasal undifferentiated carcinoma

Describe recently by Frieson et al, also known as anaplastic carcinoma and difficulty in distinguishing from high-grade OAN. Commonly producing very few symptoms is a highly aggressive and invasive tumour.

Melanoma

Among sinonasal malignancy accounting for 3.6 %, with a predilection in women and elderly. The usual sites are nasal cavity and the septum . Appearances vary from as polypoid to ulcerated mass. Variation in pigmentation has been noticed. Metastasizes more often to lungs and brain rather than draining lymph nodes of neck.

Haemangiopericytomas

Accounting <5 %, they are rare tumours originating from the pericytes in the outer capillary wall. Of the head and neck haemangiopericytomas 20% develop from nasal cavity and sinus. They are commonly associated with administration of steroid therapy, trauma, systemic hypertension and pregnancy. Macroscopic examination shows a red-grey, polypoid lesions firm in consistency. Metastasis is rare. Being relatively radioresistant Complete surgical excision is mandatory. Recurrence rate is 10-60%.

CLINICAL FEATURES OF SINONASAL MALIGNANCY

Maxillary Tumor

- Nasal obstruction
- Epistaxis
- Infraorbital anaesthesia
- Toothache
- Facial swelling
- Facial pain
- Trismus

ETHMOID TUMOR

- Nasal obstruction
- Epistaxis
- Proptosis or diplopia
- Neck swelling

PATTERNS OF TUMOUR SPREAD

Local Spread

Spread of Maxillary sinus malignancies

- Medially to lateral nasal wall
- Laterally to the cheek
- Superiorly to the orbit via the inferior orbital fissure
- Inferiorly spread is to palate
- Posteriorly tumour spreads to the infratemporal fossa and pterygopalatine fossa.

Spread of malignancies of ethmoid sinus

- Medial spread to nasal cavity,
- Lateral spread to orbit,
- superiorly extends to the anterior cranial fossa and
- Inferiorly, it extends to maxillary sinus.

REGIONAL LYMPHATIC SPREAD

Spread through lymphatics is commonly to submandibular and jugulodigastric nodes. Seen apparently in 25-35% of affected, with 10% affected during presentation.

DISTANT METASTASIS

It is generally unusual at the initial stages of presentation. Seen in 18% of adenocarcinomas and 10% of squamous cell carcinmoas. The bone, brain, liver, lung and skin are common metastatic sites. Signifies worst prognosis.

Krouse Classification

T1 - The tumour is limited to the nasal cavity only.

T2 - Tumour is limited to ethmoid sinuses, medial and superior portions of maxillary sinuses

T3 – Tumour involves the lateral or inferior aspects of maxillary sinus or extension into frontal or sphenoid sinuses

T4 - This stage involves tumor spread outside the confines of nose and sinuses. This stage also includes malignancy

TNM CLASSIFICATION OF PARANASAL SINUS TUMOURS ARE AS FOLLOWS -TUMOUR STAGING

TX	Primary tumor cannot be assessed.
T0	No evidence of primary tumor.
Tis	Carcinoma in situ.
MAXILLARY SINUS	
T1	Tumor limited to maxillary sinus mucosa with no erosion or destruction of bone.
T2	Tumor causing bone erosion or destruction including extension into the hard palate and/or middle nasal meatus, except extension to posterior wall of maxillary sinus and pterygoid plates.
T3	Tumor invades any of the following: bone of the posterior wall of maxillary sinus, subcutaneous tissues, floor or medial wall of orbit, pterygoid fossa, or ethmoid sinuses.
T4a	Moderately advanced local disease.
	Tumor invades anterior orbital contents, skin of cheek, pterygoid plates, infratemporal fossa, cribriform plate, or sphenoid or frontal sinuses.
T4b	Very advanced local disease.
	Tumor invades any of the following: orbital apex, dura, brain, middle cranial fossa, cranial nerves other than maxillary division of trigeminal nerve (V2), nasopharynx, or clivus.
NASAL CAVITY AND ETHMOID SINUS	
T1	Tumor restricted to any one subsite, with or without bony invasion.
T2	Tumor invading two subsites in a single region or extending to involve an adjacent region within the nasoethmoidal complex, with or without bony invasion.
T3	Tumor extends to invade the medial wall or floor of the orbit, maxillary sinus, palate, or cribriform plate.

T4a	Moderately advanced local disease.
	Tumor invades any of the following: anterior orbital contents, skin of nose or cheek, minimal extension to anterior cranial fossa, pterygoid plates, or sphenoid or frontal sinuses.
T4b	Very advanced local disease.
	Tumor invades any of the following: orbital apex, dura, brain, middle cranial fossa, cranial nerves other than (V2), nasopharynx, or clivus.

REGIONAL LYMPH NODES (N)

NX	Regional lymph nodes cannot be assessed.
N0	No regional lymph node metastasis.
N1	Metastasis in a single ipsilateral lymph node, ≤3 cm in greatest dimension.
N2	Metastasis in a single ipsilateral lymph node, >3 cm but ≤6 cm in greatest dimension, or metastases in multiple ipsilateral lymph nodes, ≤6 cm in greatest dimension, or in bilateral or contralateral lymph nodes, ≤6 cm in greatest dimension.
N2a	Metastasis in a single ipsilateral lymph node, >3 cm but ≤6 cm in greatest dimension.
N2b	Metastases in multiple ipsilateral lymph nodes, ≤6 cm in greatest dimension.
N2c	Metastases in bilateral or contralateral lymph nodes, ≤6 cm in greatest dimension.
N3	Metastasis in a lymph node, >6 cm in greatest dimension.

DISTANT METASTASIS (M)

M0	No distant metastasis.
M1	Distant metastasis.

CLINICAL EVALUATION

ENDOSCOPY

Detailed direct nasal endoscopic examination with rigid and flexible endoscopies is necessary in suspected cases of malignancy to diagnose even earlier phases of tumours

IMAGING

Bone-windowed CT with axial and coronal views are necessary for reconstructing exact details of erosion of bones and involvement of skull base. MRI gives soft tissue involvement.

Gadolinium enhanced MRI enhances the vascular detail including flow voids, in addition to detecting dural or cerebral infiltration.

ARTERIOGRAPHY

It may be appropriate if the lesion demonstrates enhancement during contrast CT. In cases of vascular tumour can be taken for preoperative embolization.

BIOPSY

Tissue biopsy is essential in tumour evaluation .The rare entities may bleed during sampling and hence to be done under general anaesthesia. The tumors can also be biopsied under local

anaesthesia. In order to avoid complications in subsequent resection it is advisable to avoid Caldwell-Luc approach.

MANAGEMENT

Most patients come with an initial presentation of advanced disease, of which some are incurable, who can choose between curative and palliative treatment. For those opting the latter it is mandatory to record the presenting symptoms and signs to observe their effect on patients' life and extent of disease. Potentially curable forms are given a combination of surgery and radiotherapy..The trend is shifting toward a radical procedure even in early stages for en-bloc resection. Majority of sinonasal malignancies require multimodality therapy. Surgery has been the cornerstone of therapy for neoplasm of the paranasal sinuses. No single modality of treatment has been shown to be successful and in most centers a combination of treatment modalities are used . Saki et al achieved a 5-year survival rate of 54% with combination of radiotherapy, intra-arterial infusion of 5-flurouracil, surgery , immunotherapy and curettage. Konno et al used a maximum combination of radiation therapy, intra-arterial chemotherapy (5-FU) , sufficiently extensive maxillectomy and primary reconstruction to achieve a 5-year survival rate of 64.1%.

The optimal treatment option is not standardized and many issues remain controversial.

SURGERY OR RADIOTHERAPY ALONE

Early, small localized lesions of favourable histology may be amenable to surgical resection alone as definitive therapy. Radiotherapy alone may be effective for localized (T1) radiosensitive lesions, vestibular carcinomas and localized lymphomas .

COMBINATION OF SURGERY AND RADIOTHERAPY

Surgery combined with postoperative Radiotherapy is the standard treatment for most sinonasal malignancies. Until recently, the standard treatment was full-course irradiation followed in about 6 weeks by resection. Most authorities believe that the extent of resection should be based on the full extent of tumor before radiotherapy and should not be altered because of tumor shrinkage. Studies favoring preoperative radiotherapy include those by Jackson et al, Yu-Hua ,Sisson, Sharma et al with a 5 year disease free survival rate of 43%,64% and 65% respectively for the first 3 studies and a 3 year disease free survival rate of 51.21% for the latter study. Advantages of pre-operative radiotherapy include making inoperable lesions operable, reducing the risk of distant

metastasis due to dissemination during surgical manipulation by reducing the viability of tumor cells and the argument that microscopic disease is more radiosensitive before surgery because of better blood supply. The two apparent advantages of post-operative radiotherapy. are as follows:

1) Tissue healing will not be a problem and a higher total dose can be delivered.

2) The full extent of tumor can be accurately determined, reducing the likelihood of a “geographic miss” and also making it easier to define the radiation therapy portals.

Surgery for maxillary tumours

Varied procedures are being described. Extension of the tumour and amount of bone to be resected determines the choice of procedure.

PARTIAL MAXILLECTOMY

This refers to partial removal of the maxilla.

Two types of partial maxillectomy are:

1) Medial maxillectomy which involves the tumour clearance of the lateral wall of the nose including the ethmoid sinuses.

2) Tumours of the oral cavity that involving the hard palate is treated with palate resection. It is also called fenestration procedure. These fenestrations are closed with free flap grafts.

Subtotal maxillectomy

It is a type of partial maxillectomy in which one of the buttress or perimeters that are normally removed in total maxillectomy is preserved especially orbital floor is preserved .

Indications

All the tumours of the maxilla involving the medial wall and the floor

Contraindications

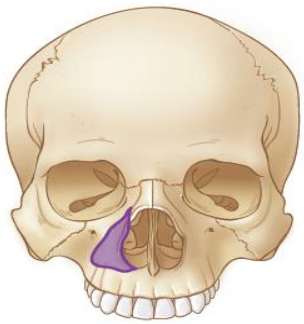
Tumours involving the orbital floor, pterygoid fossa, lateral wall, palate or with intracranial involvement.

TOTAL MAXILLECTOMY

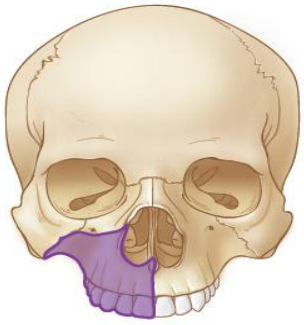
This refers to the total removal of the entire maxilla with the tumour.

EXTENDED MAXILLECTOMY

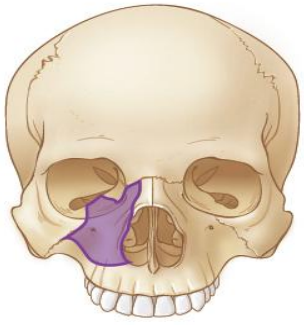
Extended maxillectomy is done when the tumour extends beyond the maxilla involving the skull base.



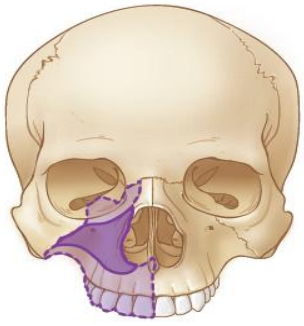
Medial Maxillectomy



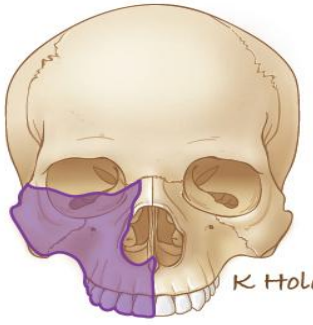
Infrastructure Maxillectomy



Suprastructure Maxillectomy



Subtotal Maxillectomy



Total Maxillectomy

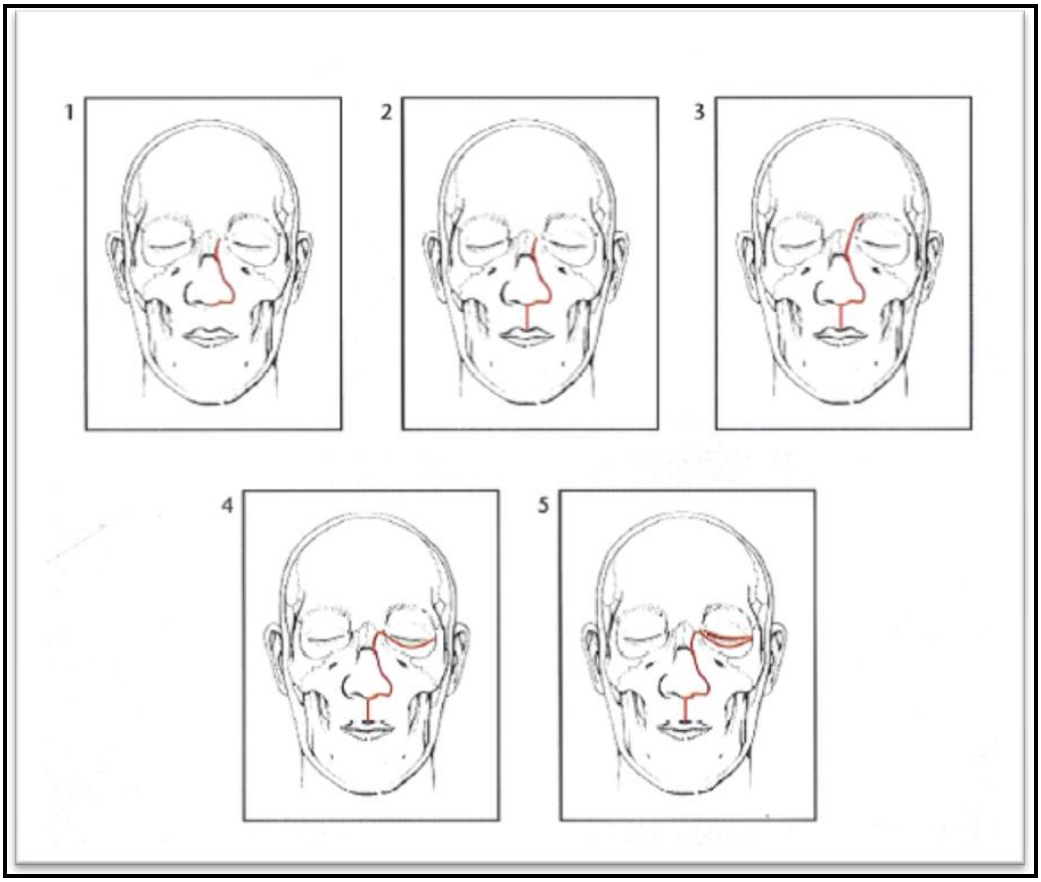
Surgical approaches

Various bone resections are easily done if an apt soft tissue approach is chosen. The various soft tissue approaches used are .

1) Lateral rhinotomy approach.

2) .Weber–Fergusson approach:

3) Midfacial degloving approach.



1) Moure ‘ s incision 2) Weber fergusson incision3) Weber fergusson with lynch extention 4) Weber fergussion with lateral subciliary extention 5) Weber fergusson with supraciliary and subciliary extention

ENDOSCOPIC MEDIAL MAXILLECTOMY

INTRODUCTION

Medial maxillectomy is a procedure commonly used for the removal of benign and low-grade malignant tumors of the medial aspect of the maxilla, the lateral nasal wall, the ethmoid sinuses, and the lacrimal sac. The endoscopic approach allows superior illumination and magnification, as well as providing the ability to treat diseases that extend beyond the limits of the traditional external medial maxillectomy. The endoscopic medial maxillectomy procedure can also be used to treat chronic maxillary sinusitis recalcitrant to traditional endoscopic maxillary antrostomy. Endoscopic medial maxillectomy can be performed in conjunction with a Caldwell-Luc procedure. Indications for endoscopic medial maxillectomy include sinonasal neoplasms, inverted papilloma, and intractable inflammatory maxillary disease.

PREOPERATIVE CONSIDERATIONS

Endoscopic medial maxillectomy is performed using general anesthesia. The use of total intravenous anesthesia has been shown to reduce intraoperative blood loss. Patients must be counseled

regarding potential lacrimal duct transection and dacryocystorhinostomy (DCR).

Preoperatively, the nose is decongested with topical 1% oxymetazoline and topical 4% cocaine before endoscopy. The mucosa of the inferior turbinate and lateral nasal wall is first infiltrated with mixture 1% lidocaine and 1:100,000 epinephrine. A septoplasty may be performed if a septal deflection prevents access to the middle meatus. However, indications for a septal window must be considered before a septoplasty is performed, especially if access to the anterior maxillary wall is necessary.

Radiographic Considerations

All patients should undergo computed tomographic (CT) imaging. In patients with a tumour this is very helpful in determining the site of ttachment.The CT should also be examined for any focal bony erosion.. All boundaries of the sinus must be inspected for tumor, and triplanar imaging is helpful to complete this task.

Magnetic resonance imaging (MRI) helps the surgeon distinguish tumor from inspissated secretions or polypoid

mucoperiosteal thickening and reveals the status of extranasal tissue when sinus bone is eroded.

INSTRUMENTATION

- 0-, 30-, and 70-degree endoscopes
- Ball-tip probe
- Backbiting and downbiting punches
- Through-cutting punches
- Endoscopic scissors
- Angled and straight tissue debrider with 15- and 70-degree drill attachments
- Curettes
- Bipolar dithermy
- Motor with drill and burrs
- All other routine instruments.

PEARLS AND POTENTIAL PITFALLS

Pearls

The endoscopic technique can adhere to key oncologic principles by enabling complete resection of the tumor pedicle and allowing adequate margin control through the examination of

frozen sections intraoperatively. Preserving a nasal floor mucosal flap aids in covering exposed bone after completion of the medial maxillectomy. Visualization using a 70-degree endoscope is performed through the mega-antrostomy, and instruments can be passed through an inferior meatal window to access disease in the most anterolateral aspects of the maxillary sinus.

Alternatively, a septal window may be fashioned for more direct examination of the anterior and lateral walls.

Potential Pitfalls

Knowledge of sinonasal anatomy is paramount, because tumors such as inverted papillomas can often distort the normal anatomy, and iatrogenic injuries to surrounding structures can result. Poor preoperative analysis of the CT and MRI scans can result in inadequate disease resection. Intraoperative injury to the lacrimal apparatus can cause postoperative epiphora and lead to dacryocystitis. A dacryocystorhinostomy should be performed at the time of resection if injury is suspected. Inadequate exposure can limit the use of instruments necessary for complete tumor resection as well as hinder postoperative surveillance for disease recurrence. Postoperative lateralization of the middle turbinate with synechiae formation can make the mega-antrostomy inaccessible for surveillance

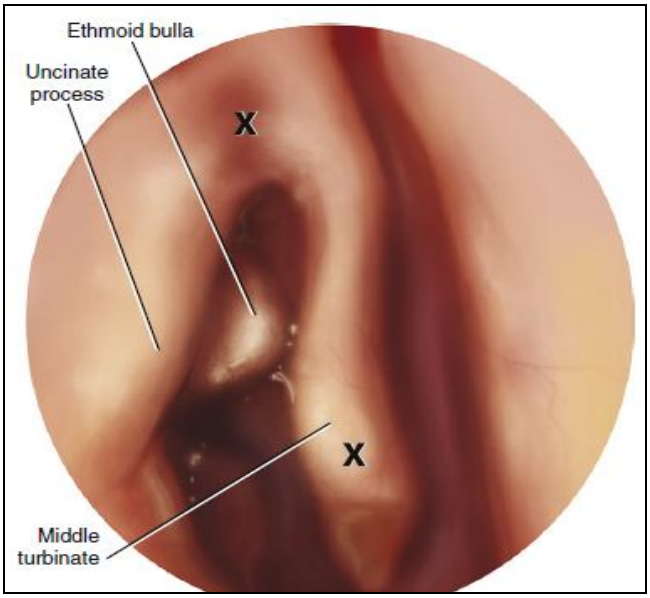
SURGICAL PROCEDURE

Step-1: Debulking of the Tumor

Reflect the middle turbinate toward the septum and inspect the middle meatus. As the initial step, debulk the tumor with a debrider to locate the site of attachment . Collect all sinonasal contents in a suction trap.

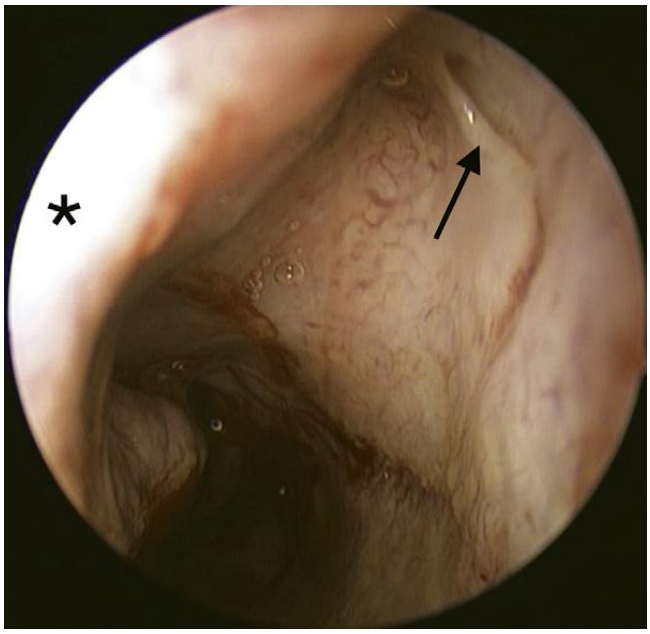
Step 2: Removal of the middle turbinate ,uncinate process and identification of the natural ostium

The portion of middle turbinate attached to the lateral nasal wall is cut following bipolar cautery. Resect the uncinate process with a backbiting instrument and identify the natural os of the maxillary sinus using a 30-degree endoscope . Widen the natural ostium with through-cutting forceps or the microdebrider posteriorly and inferiorly.



Step 3: Identification of the Hasner Valve

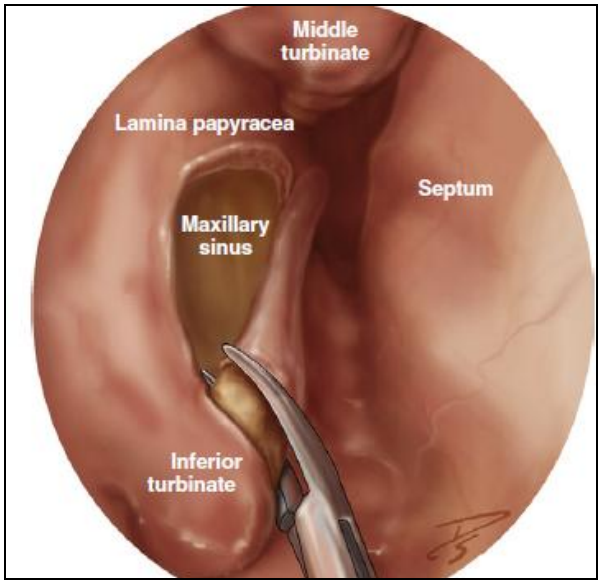
Once a wide antrostomy is performed, identify the Hasner valve in the inferior meatus .The valve is located approximately 30 to 35 mm posterior to the limen nasi. If tumor involves the nasolacrimal duct, sacrifice it and perform a DCR at the conclusion of the procedure to prevent epiphora.



Step 4: Subtotal Inferior Turbinectomy

Begin by using a Freer elevator to medialize the inferior turbinate along its length. Use turbinate scissors to cut the anterior portion of the inferior turbinate, angling the cut posterior to the distal end of the nasolacrimal duct (Hasner valve).The turbinate may be left attached to the lateral nasal wall after the anterior cut to attempt an en bloc resection or removed before creation of the nasal

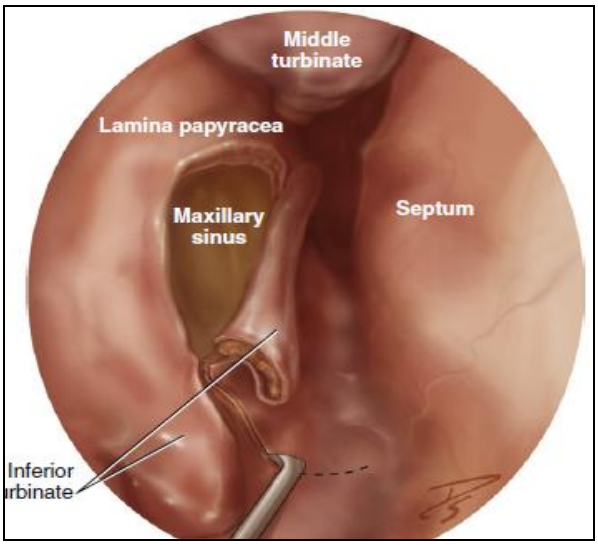
mucosal flap. Using turbinectomy scissors the posterior portion of inferior turbinate is cut and flushed with posterior maxillary wall .The posterior inferior turbinate remnant tends to bleed from the posterolateral nasal artery. Use the suction bipolar cautery device to cauterize the residual posterior portion.



Step 5: Creation of a Nasal Floor Mucosal Flap

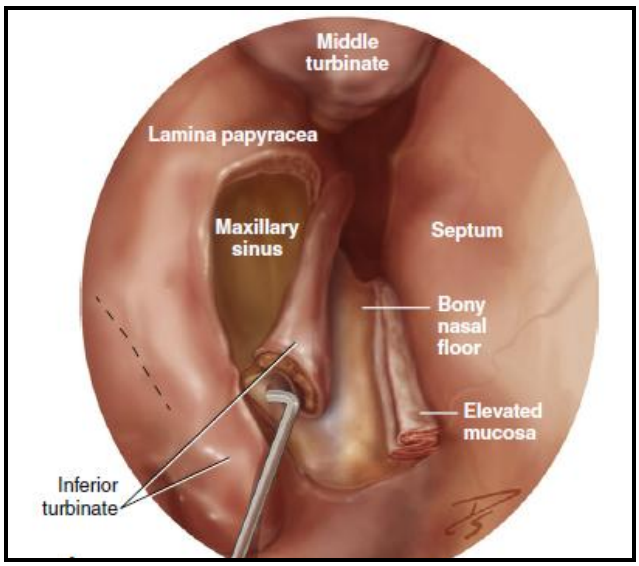
Use a curved Beaver blade to make the anterior incision by incising the mucosa just inferior to the attachment of the inferior turbinate and slightly posterior to the Hasner valve. Carry the cut medially onto the nasal floor ending at the base of the septum . Begin the posterior incision at the level of the posterior maxillary wall, again just inferior to the attachment of the inferior turbinate and extending onto the nasal floor, ending at the base of the septum. Use a straight Beaver blade to connect the anterior and

posterior incisions by incising the mucosa just inferior to the attachment of the inferior turbinate along its whole length. Making the incision as close as possible to the attachment of the inferior turbinate will create greater flap length. Use a suction Freer elevator to elevate the mucosal flap off of the nasal floor and roll it medially toward the septum



Step 6: Identify the Location of the Anterior Cut of the Medial Maxillary Wall

Identify the inferior meatus (Hasner valve) just inferior to the attachment of the inferior turbinate at its anterior end. Using a J-curette, punch through the medial maxillary wall into the maxillary sinus just posterior and inferior to the inferior meatus (Hasner valve) to identify the site of the anterior cut



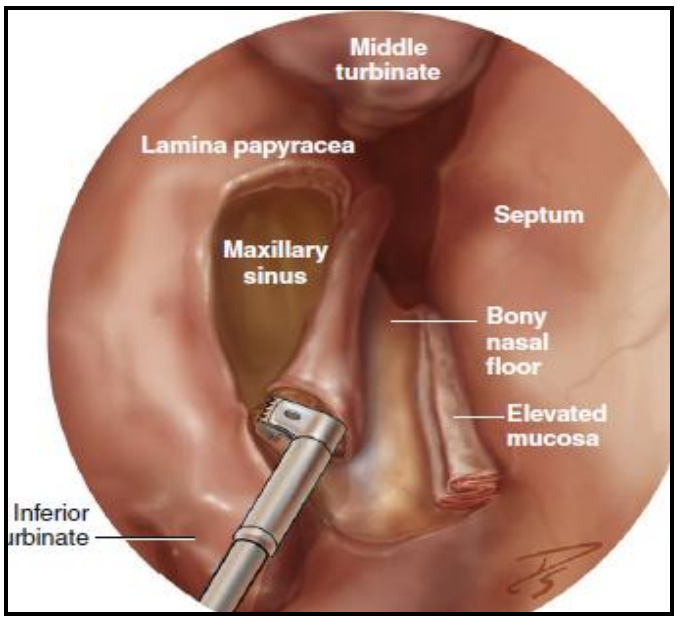
J-curette to make an inferior osteotomy in the medial maxillary wall

Step 7: Create a Mega antrostomy

Extend the antrostomy in the lateral nasal wall posteriorly through the posterior fontanelle with through-Cut forceps (or scissors).Use backbiting forceps to enlarge the cut anteriorly (inferior to the Hasner valve) to a level flush with the anterior maxillary wall .

Step 8: Make the Anterior Osteotomy in the Medial Maxillary Wall

Use angled through-Cut forceps, scissors, or sidebiting forceps to incise just posterior to the nasolacrimal duct and connect with the maxillary antrostomy. Be sure to angle the cut posterior to the Hasner valve and the nasolacrimal duct to avoid transecting the duct.

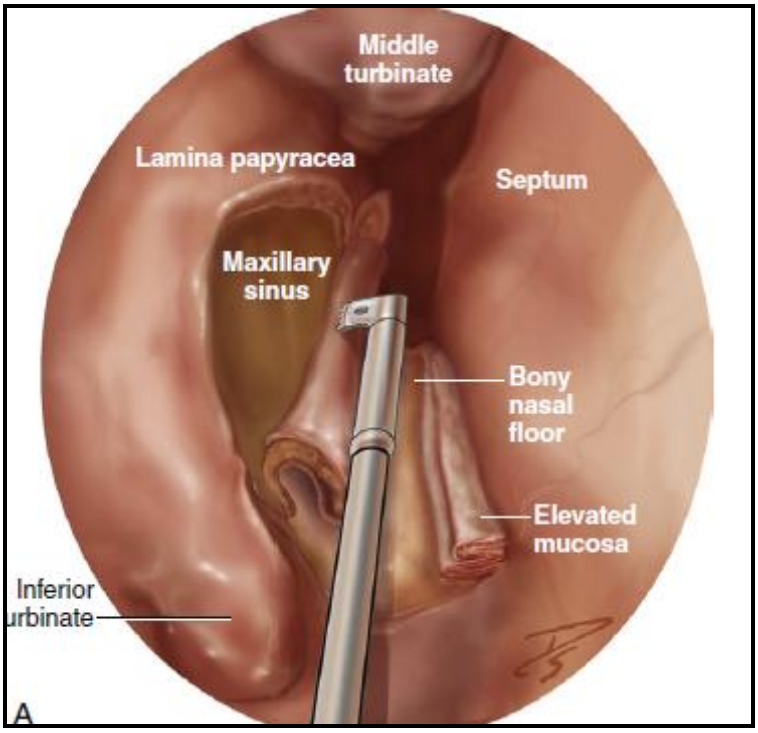


Step 9: Reflect the Wall Medially

The medial maxillectomy is now attached only posteriorly. Use a Freer elevator to push the wall medially and provide an improved view of the tumor location

Step 10: Make the Posterior Cut of the Medial Maxillary Wall

Use angled through-Cut forceps or turbinate scissors angled from an inferior to superior direction to incise flush with the posterior maxillary wall through the inferior turbinate.



Posterior cut of the medial maxillectomy using a through-Cut instrument

Step 11: Remove the Medial Maxillary Wall (with or without the Inferior Turbinate)

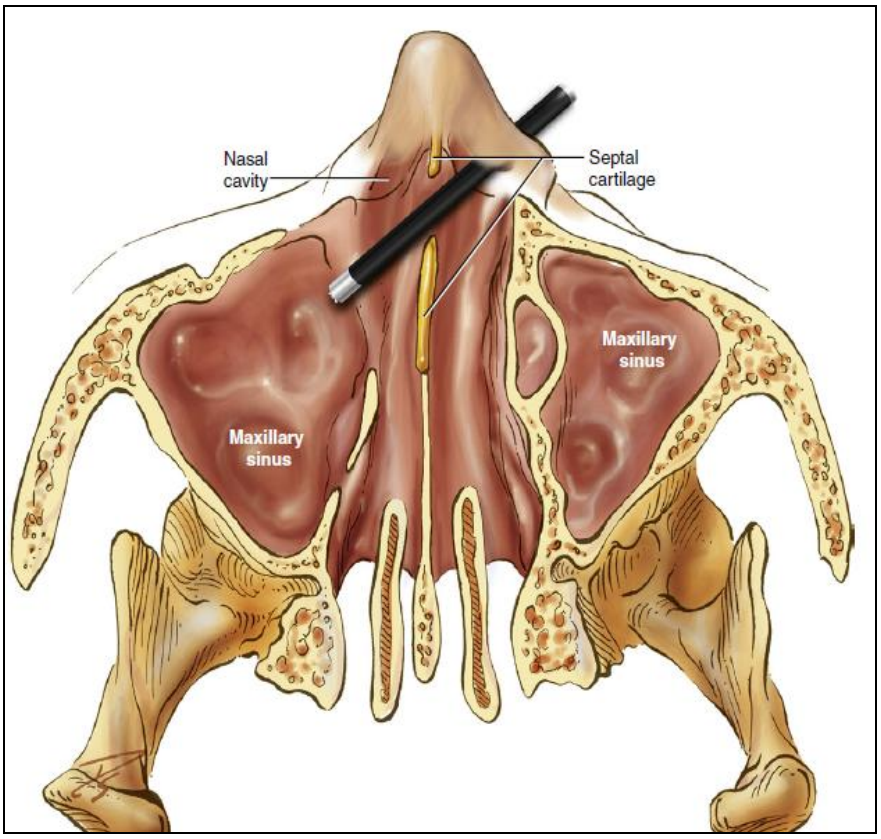
Step 12: Exposure of the Anterior, Inferior, or Lateral Maxillary Sinus (When Necessary)

Use backbiting instruments to resect the lacrimal bone (and nasolacrimal duct) up to the nasal aperture. To further improve visualization, a septal window may be created or a septal translocation performed.

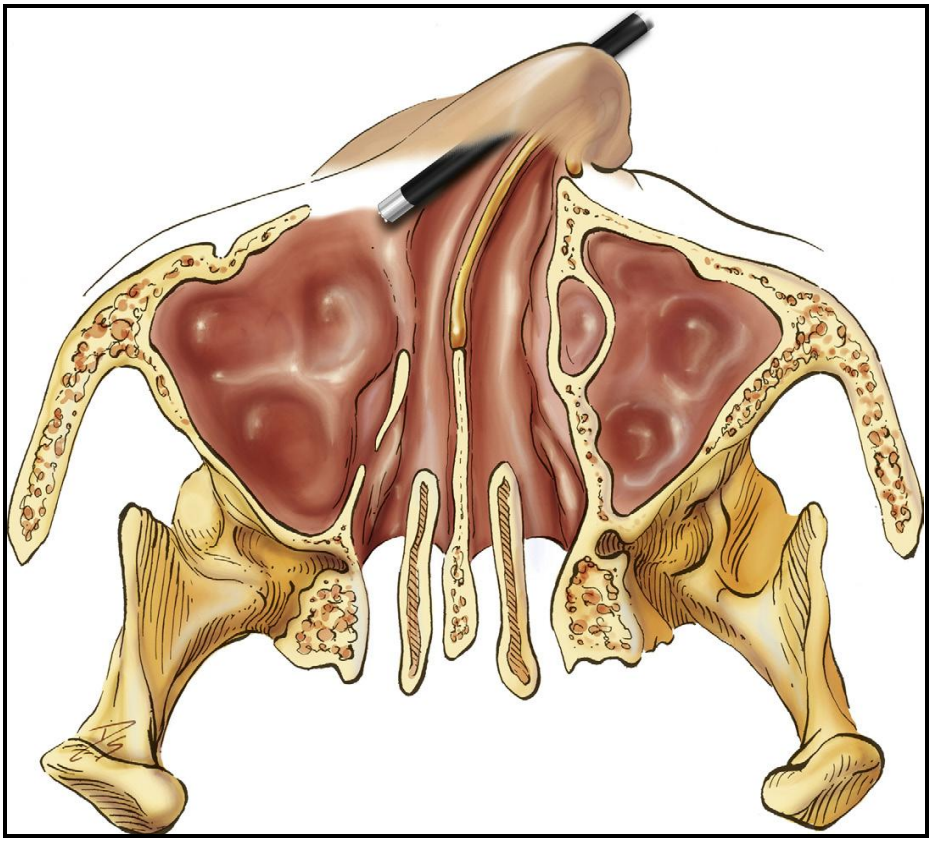
Septal window: Resect a cartilaginous portion of the anterior nasal septum and introduce the endoscope from the contralateral side. Fashion the septal window either by elevating and incising

mucoperichondrial flaps in a stepwise fashion or by performing a complete transection, including transection of the mucoperichondrium, to create a septal perforation

Septal translocation: Make a contralateral hemitransfixation incision and elevate the mucoperichondrial flap. Once the septum is exposed, use a No. 15 blade to cut the septal attachment to the maxillary spine. The anterior septum becomes mobile and can easily be lateralized to improve endoscope angle



Septal window



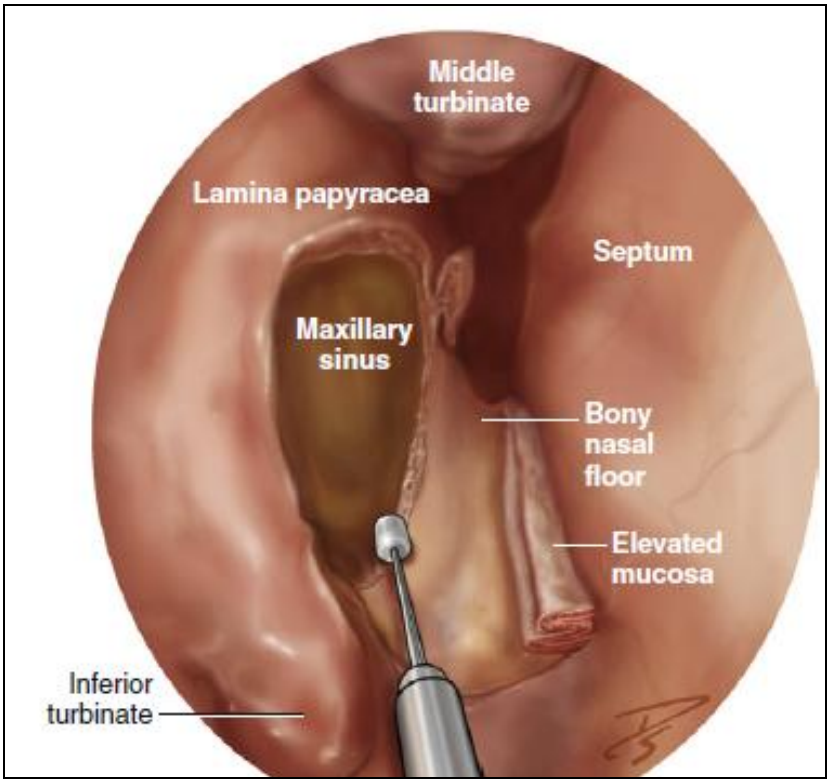
Septal translocation

Step 13: Removal of the Tumor Pedicle

An inverted papilloma may infiltrate the underlying bone at the site of attachment, which may harbor occult tumor; therefore, this bone must be removed. Using a high speed combined suction irrigation diamond burr to thin down the bone along the attachment site of the tumor is addressed . Upon completion, replace the mucosal flap and drape it into the maxillary defect

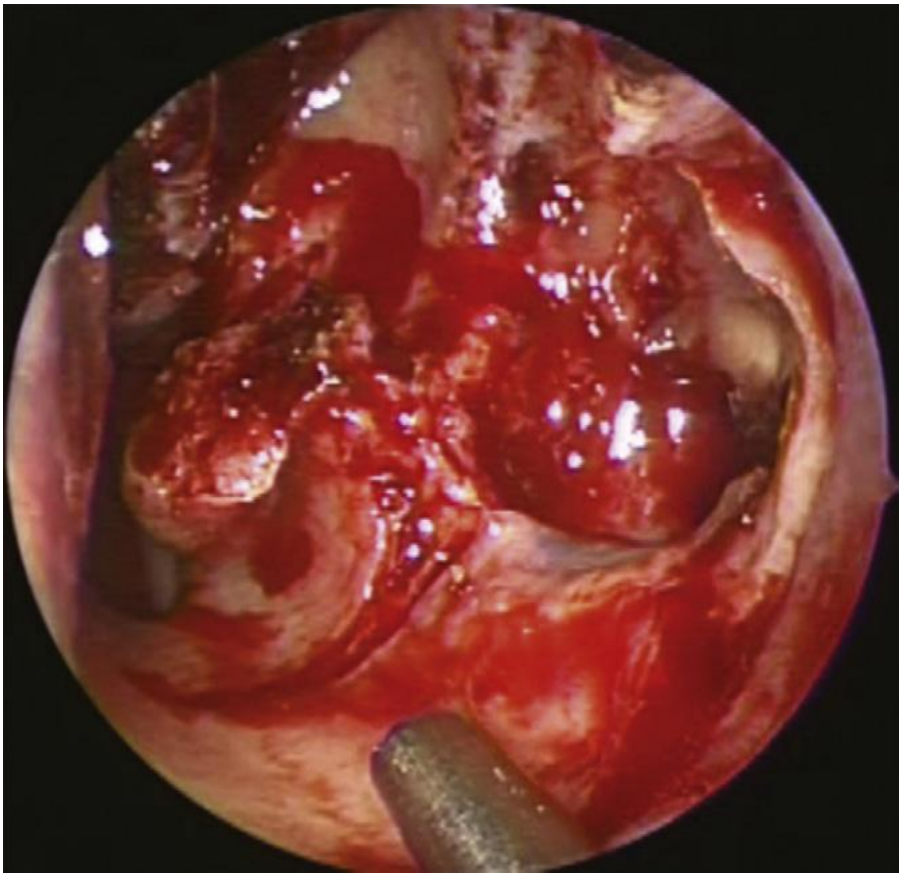
Step 14: Drill the Remainder of the Inferior Maxillary Ridge Flush with the Nasal Floor If Necessary

An inferior ridge of the medial maxillary wall will still be present after the osteotomies. Use the 15-degree diamond bur to drill this flush with the nasal floor .



Step 15: Replace the Nasal Floor Mucosal Flap

Using a Freer elevator, lay the nasal floor mucosal flap back in place. The flap should lie partially on the floor of the maxillary sinus completely covering the area of exposed bone left behind after removal of the medial maxillary wall .



Picture showing tumour removed after completion of medial maxillectomy

Step 16: Management of Ethmoid Involvement

For effective marginal clearance, the superior and lateral remnant mucosa of ethmoid sinuses are removed.

Step 17:Management of medial wall of orbit

The lamina papyracea and the medial wall of the orbit that is adjacent can be removed. Sphenoid sinus anterior wall is resected if necessary

Step 18: Endoscopic Dacryocystorhinostomy(When Necessary)

When the nasolacrimal duct is transected, a DCR is advised to prevent postoperative nasolacrimal duct stenosis.

MODIFICATIONS

Extended endoscopic medial maxillectomy

For more anterior access, the medial buttress of the medial maxillary wall may be completely removed .

The entire inferior turbinate may be removed for more exposure.

A canine fossa puncture (Caldwell Luc) can be combined as an auxiliary site for instruments (endoscopes or debrider) to provide increased visibility and access.

Dissection can be carried upto inferior part of the fovea ethmoidalis extending upto sphenoid rostrum

Modified medial maxillectomy

Type	Indication	Procedure
I	Recirculation mechanism due to two windows in middle meatus and inferior meatus (e.g., previous inferior meatal antrostomy)	Middle meatus and inferior meatal windows joined, creating a mega ostium, inferior turbinate partially resected
II	Abnormal dye test indicating disease of maxillary sinus mucosa	
IIa	Delayed clearance of dye; allergic fungal rhinosinusitis	Modified endoscopic medial maxillectomy, nasolacrimal duct preserved, maxillary sinus mucosa left intact
IIb	No clearance of dye	Modified endoscopic medial maxillectomy, nasolacrimal duct preserved, maxillary sinus mucosa stripped off by through an antral window

POSTOPERATIVE CONSIDERATIONS

Ensure that hemostasis is achieved at the cut ends of the inferior turbinate. Two quarter-inch polyvinyl acetal sponges (cut to size) in a pinky finger of a nonlatex glove may be placed loosely within the cavity to put mild pressure on the nasal mucosal flap and decrease crusting.The postoperative care of the patient involves irrigation with saline solution to remove clots and crusts followed

by serial in-office debridements. Crusting may persist for 4 to 6 weeks after surgery. Twice daily saline irrigations are effective in treating fetid crusts. If DCR was required, the patient should be instructed to massage the nasolacrimal duct externally during the postoperative period. Long-term surveillance for recurrence of inverted papilloma or for any malignant transformation is indicated in these patients.

MATERIALS AND METHODS

Study Design : Prospective and retrospective

Study Period : October 2012 to October 2014

Ethical Clearance: Applied for Institutional clearance

Inclusion criteria

- Age above 12 years
- Sex- both male and female
- All early stage tumours - benign or malignant involving medial wall of maxilla and maxillary sinus (which lie below the ohngren s line.)
- Patients with Co morbid conditions under control not fit for major procedures.
- Patients who have good compliance for post operative follow up.

Exclusion Criteria

- Children less than 12 years, pregnancy.
- Terminally ill patients
- Malignancy of maxillary sinus with metastasis and advanced stages of malignancies
- Patients with poor follow up

INVESTIGATION

- Diagnostic nasal endoscopy
- CT Scan para nasal sinus- plain & contrast
- MRI paranasal sinuses – MRI & MRA
- Histopathological examinations.
- Metastasis work up using chest xray, ultrasonogram of neck and abdomen , bone scan

METHODOLOGY

This is a prospective study conducted in our institute between October 2012 to September 2014. Twenty four patients underwent endoscopic medial maxillectomy over the period of two years. There were eleven males and thirteen females .The most common presenting feature was nasal obstruction and swelling in the nasal cavity. The other co morbid conditions include diabetes and hypertension in two patients. The most common clinical finding was mass in the middle meatus.

All the patients underwent clinical examination followed by diagnostic nasal endoscopy . CT scan of the paranasal was performed in all the cases. All the patients had involvement of the

maxillary sinus and three patients had involvement anterior ethmoid sinus. One patient had extension of the mass to septum.

All the patients were managed by endoscopic medial maxillectomy. In one patient who had involvement of the septum was in addition to medial maxillectomy partial septal resection was done.

Histopathological examination revealed thirteen patients with inverted papilloma, six patients had adenoid cystic carcinoma, and three patients with squamous cell carcinoma, two patients had adenocarcinoma,

Patients with adenoid cystic carcinoma and squamous cell carcinoma were subjected to post op radiotherapy. Three patients with adenocarcinoma were subjected to chemo radiation post operatively.

All the patients are under follow up and one patient with adenoid cystic carcinoma had recurrence was subjected to total maxillectomy.

SURGICAL TECHNIQUE

Endoscopic medial maxillectomy procedur consists of en bloc removal of entire lateral wall of nose , along with the mass, done

with full endoscopic visualization. Procedure is done under endotracheal anesthesia. Intranasal topical decongestion can be achieved with 2% oxymetazoline spray soaked pledgets of gauze. Mixture of lignocaine 1% with 1:100,000 epinephrine is infilterated transorally into the sphenopalatine foramen . Intranasal infilteration is done in the inferior meatal wall, the turbinates, and in the maxillary crest till the area of middle turbinate attachment. The mass present in the nasal cavity is debulked first with debrider. The first incision is made in the superior margin, which includes ethmoidal sinuses . The middle turbinate attachment to the lateral wall of nose is resected using bipolar cauterization followed by endoscopic scissors.A Freer elevator is used ,and dissection inferior to the fovea ethmoidalis is carried upto the sphenoid rostrum. This releases the tumour superiorly. The inferior incision is made at the site of inferior meatus . Then the mucosa is cauterized and incised with the unipolar electrocautery at the lateral wall and floor of the nose junction. Inferior meatal widening is done at the anterior end of theinferior meatus. A straight osteotome is used and the wall of inferior meatus is osteotomized upto posterior wall of maxillary sinus. The anterior margin of dissection is composed of resection of middle turbinate that is

attached to the lateral wall of nose and continues inferiorly to include both the uncinate process and the maxillary crest comprising of the nasolacrimal canal and the duct. This incision extends anteriorly to involve the head of inferior turbinate which is connected to the inferior meatotomy cuts.The soft tissue is elevated and anterior osteotomy is made along the maxillary crest right into the maxillary sinus. This bone dissection is anterior to the nasolacrimal canal .The nasolacrimal duct is divided with the endoscopic scissors as it descends from the lacrimal sac and included in the specimen. The lateral nasal wall is medially mobilized with progressive dissection thus allowing the entry into maxillary sinus. Tumor along with the lateral nasal wall is mobilized medially. The tumour can also be resected piecemeal if its lateral extention is significant within the sinus preventing complete exposure. Now , the main concentration of dissection lies n the maxillary sinus. A Freer's elevator is used to makethe posterior bone cuts through the maxillary sinus. It is done at the junction of posterior part of maxillary ostium and the orbit. With ongoing dissection the entire mass can be pedicled on to the sphenopalatine artery is cut after clipping cauterizing and cutting. The posterior two third attachment of inferior turbinate is then cut

using endoscopic scissors and removed along with the lateral nasal wall and with the tumor . Margin control is obtained by removing the remaining portions of the ethmoid sinuses superiorly and also laterally . Multiple marginal taken from the maxillary sinus and sent for histopatholgical analyses. Using 30° and 70° endoscopes preferably Karl Storz, the entire length of mucous of the superior, inferior, lateral and anterior walls of the maxillary sinus are visualized and mucosa removed . The maxillary sinus bony walls may be burred . The lamina papyracea and the medial wall of the orbit adjacent to it may be removed for the sake of margin control. The anterior wall of the sphenoid sinus may be resected whenever necessary. A DCR is then performed.

POST OPERATIVE PERIOD

The anterior nasal pack was remove on the next day . saline nasal douching was started on the following day. Patients whose histo pathologicall reports came as malignancy were referred to ration and medical oncology for chemoradiotherapy.

FOLLOW UP

All the patients were followed up at the second , third , fourth weeks , second month and every month for first year, every two months for the second year and every six month in the subsequent

years. All the patient had diagnostic nasal endoscopy during each follow up and a repeat ct scan was done if there is suspicious areas during follow up .

INTRA OPERATIVE PHOTOS

MASS IN THE NASAL CAVITY

DEBULKING OF THE MASS

MIDDLE MEATAL ANTROSTOMY BEING DONE

INFERIOR TURBINATE RESECTED

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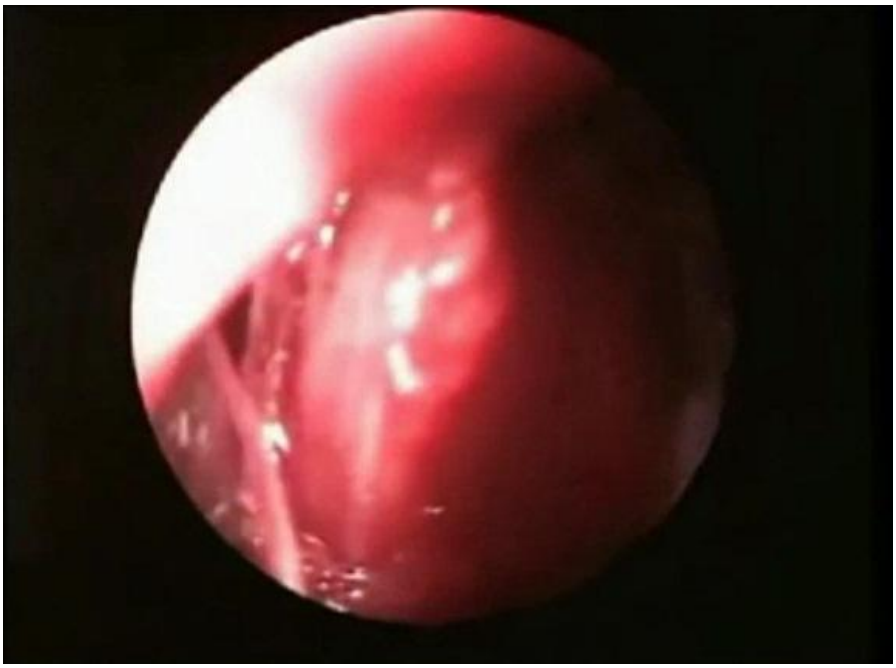
MEDIAL WALL OF MAXILLA RESECTED



MASS FROM THE MAXILLA BEING RESECTED

MEDIAL MAXILLECTOMYDONE MASS IN THE RIGHT MAXILLA DELIVERED IN TOTO

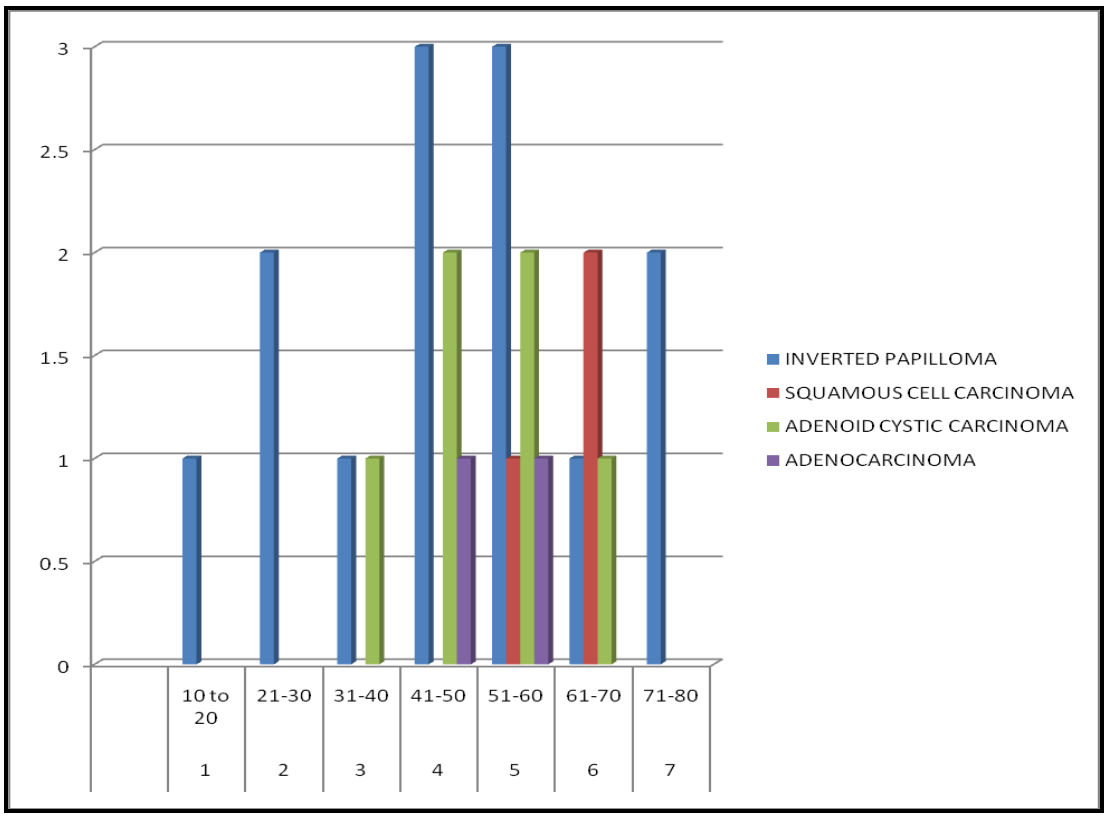
POST OPERATIVE DIAGNOSTIC NASAL ENDOSCOPY

OBSERVATIONS & RESULTS

Twenty four patients diagnosed with tumours involving maxillary sinus in the department of otorhinolaryngology , madras medical college are included in the study . among them thirteen patients are benign and eleven are malignant.

S. No	Age	Inverted Papilloma	%
1	10-20	1	7
2	21-30	2	14
3	31-40	1	7
4	41-50	3	21
5	51-60	3	21
6	61-70	1	7
7	71-80	2	14
8	TOTAL	13	

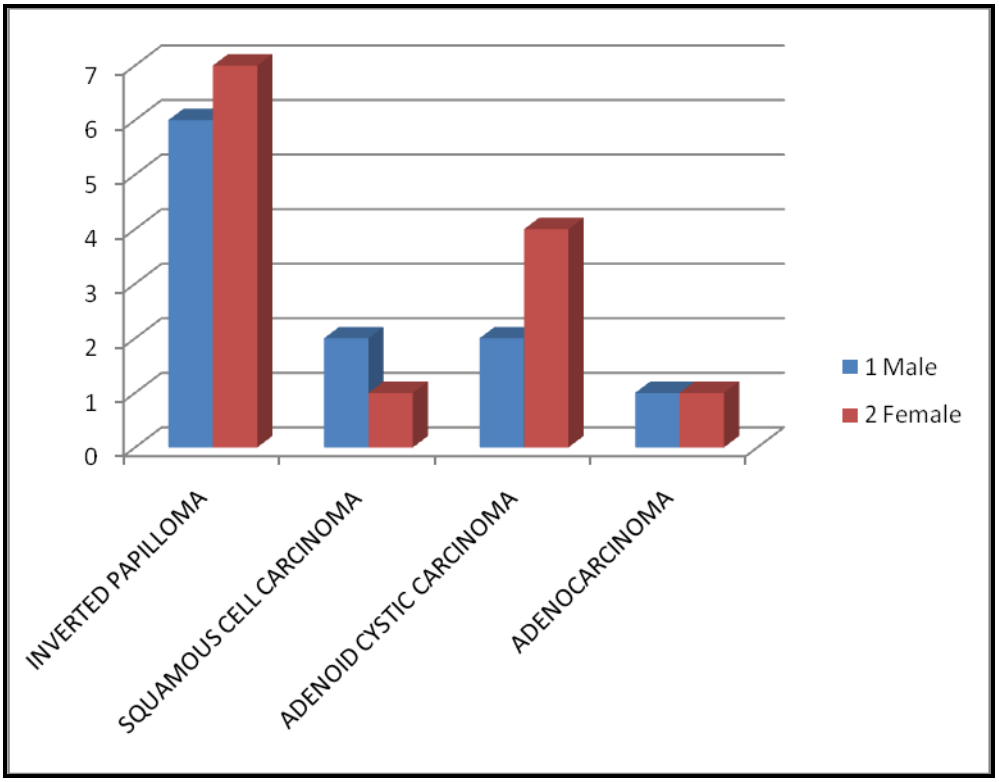
S. No	Age	Squamous cell carcinoma	Adenoid cystic carcinoma	Adeno carcinoma	Total	%
1	10-20					
2	21-30					
3	31-40		1		1	9
4	41-50		2	1	3	27
5	51-60	1	2	1	4	36
6	61-70	2	1		3	27
7	71-80					
8	Total				11	



SEX DISTRIBUTION:

S. No	Age	Inverted Papilloma	%
1	Male	6	46
2	Female	7	54
3	total	13	100

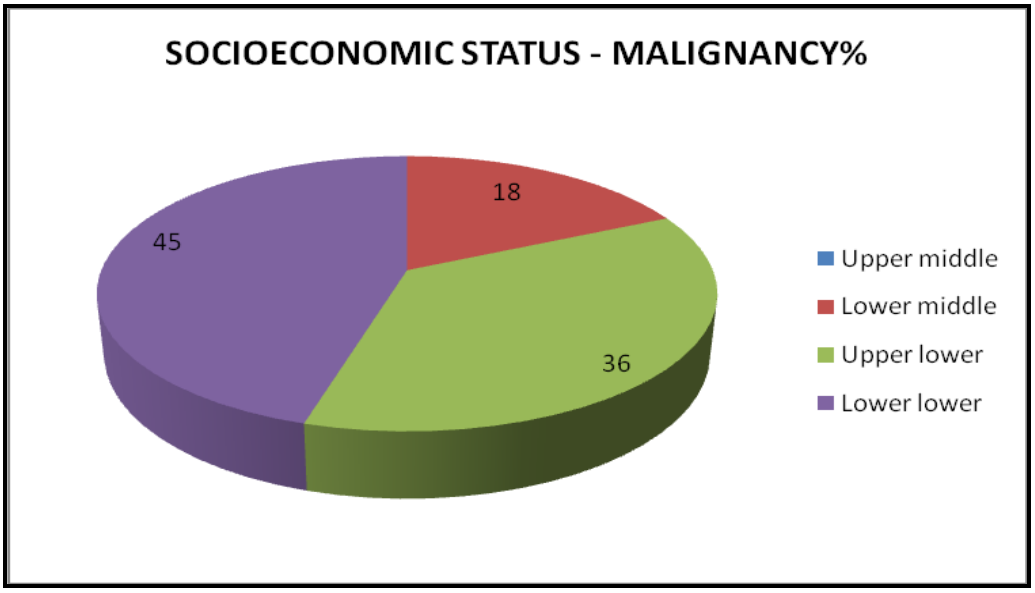
S. No	Age	Squamous cell carcinoma	Adenoid cystic carcinoma	Adeno carcinoma	Total	%
1	Male	2	2	1	5	45
2	Female	1	4	1	6	55
3	Total	3	6	2	11	100



SOCIO ECONOMIC STATUS

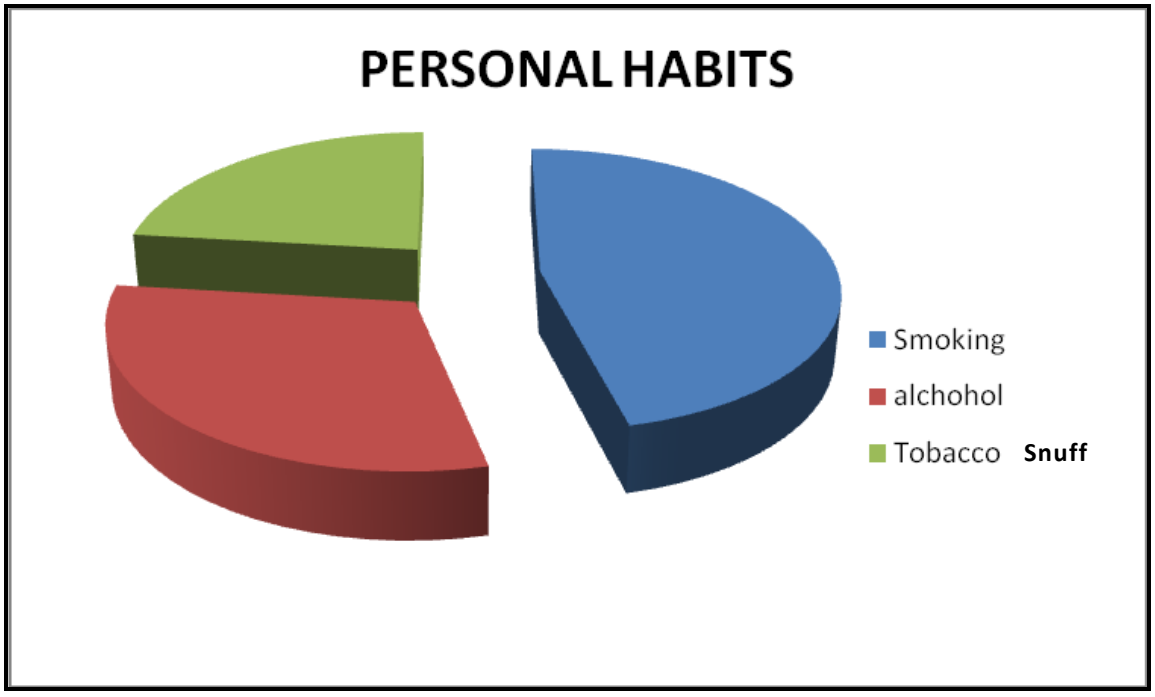
S. No	Socio Economic Status	Inverted Papilloma	%
1	Upper middle	1	7
2	Lower middle	2	14
3	Upper lower	5	35
4	Lower lower	5	35
5	total	13	

S. No	Socio economic status	Squamous cell carcinoma	Adenoid cystic carcinoma	Adeno carcinoma	Total	%
1	Upper middle					
2	Lower middle			2	2	18
3	Upper lower	1	3		4	36
4	Lower lower	2	3		5	45
5	Total	3	6	2	11	



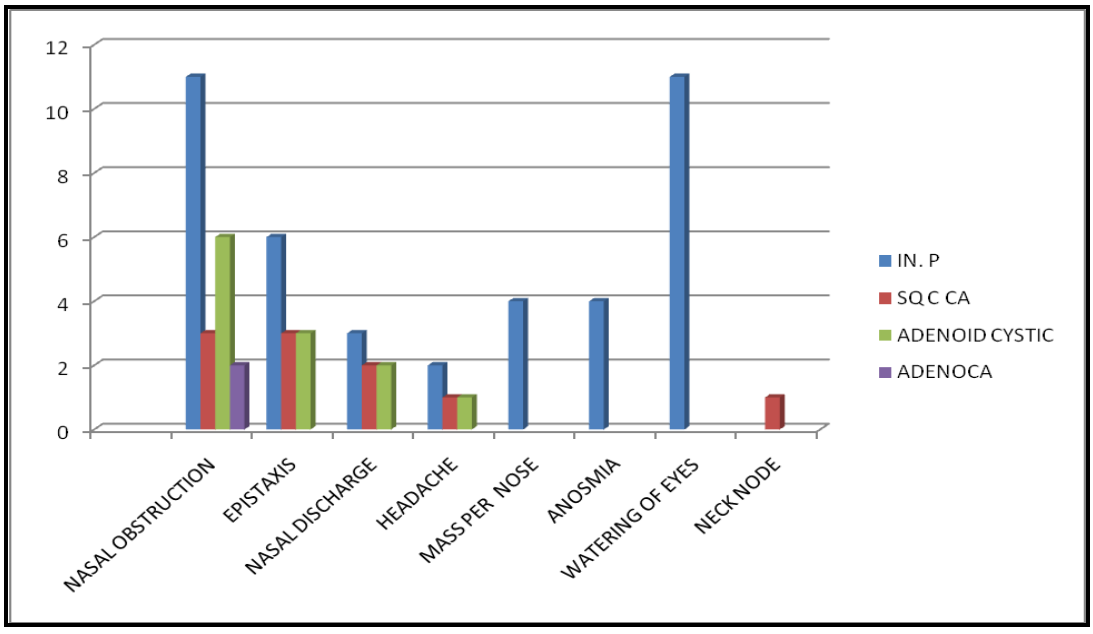
PERSONAL HABITS

S. No	Personal habits	Inverted papilloma	%	Squamous cell carcinoma	Adenoid cystic carcinoma	Adeno carcinoma	Total	Percent %
1	Smoking	5	35	2	4	1	7	63
2	Alchohol	4	28	1	3		4	36
3	snuff	4	28	1	1		2	18
Total Number of Patients		13					11	



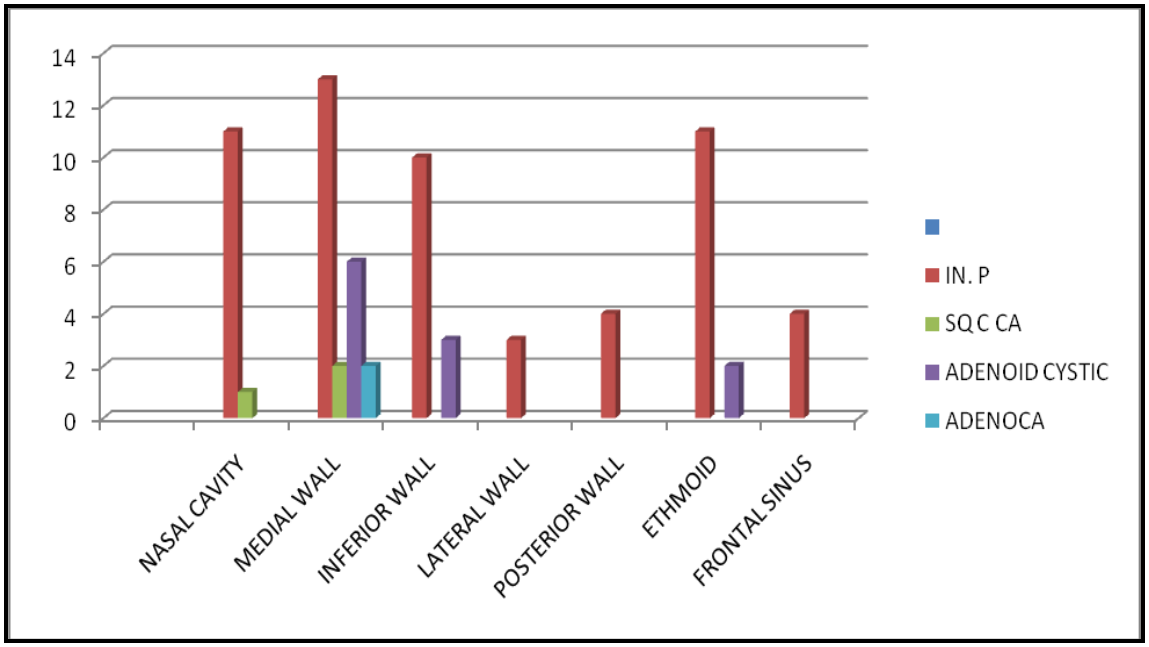
CLINICAL FEATURES

S. No	Cl/F	In. P	%	Sq c ca	Adenoid cystic	Adenoca	Total	Percent (24 patients)
1	Nasal Obstruction	11	84	3	6	2	11	100
2	Epistaxis	6	46	3	3		6	54
3	Nasal Discharge	3	23	2	2		4	36
4	Headache	2	15	1	1		2	18
5	Mass Per Nose	4	30					
6	Anosmia	4	30					
7	Watering of Eyes	11	84					
8	Neck Node			1			1	9



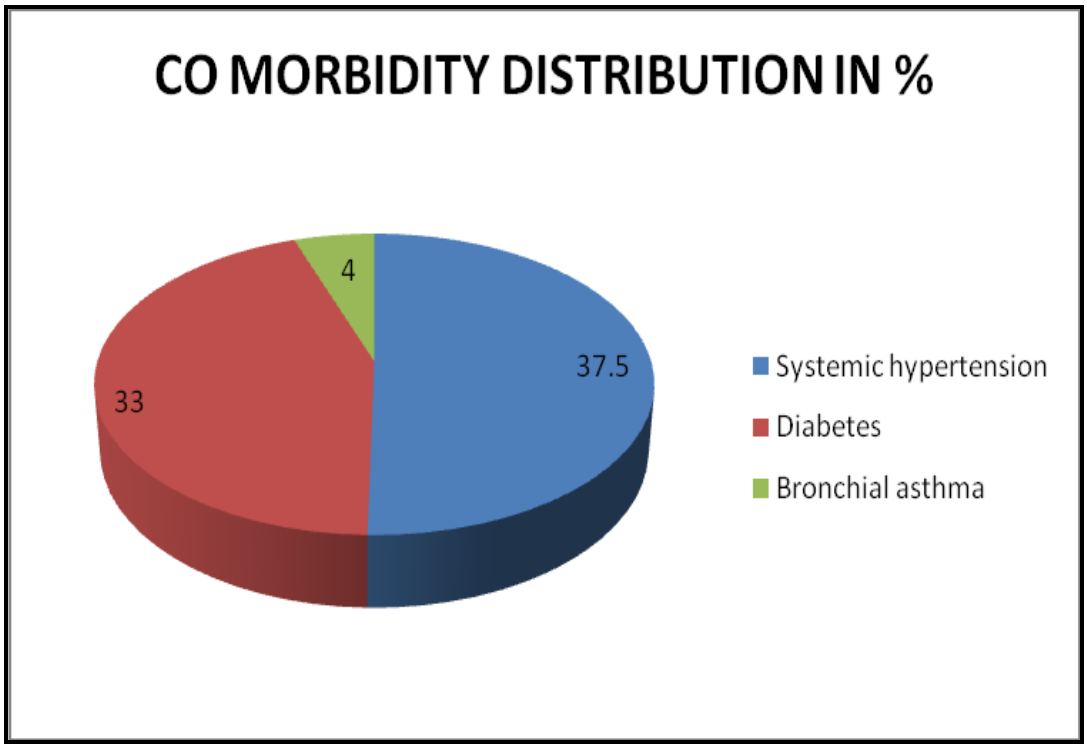
SUBSITE INVOLVEMENT

S. No	Subsite	In. P	%	Sqc ca	Adenoid cystic	Adenoca	Total	Percent (24 patients)
1	Nasal Cavity	11	84	1			1	9
2	Medial Wall	13	100	2	6	2	4	36
	Inferior Wall	10	76		3		3	27
	Lateral Wall	3	23					
	Posterior Wall	4	30					
3	Ethmoid	11	84		2		2	18
4	Frontal Sinus	4	30					
Total							11	



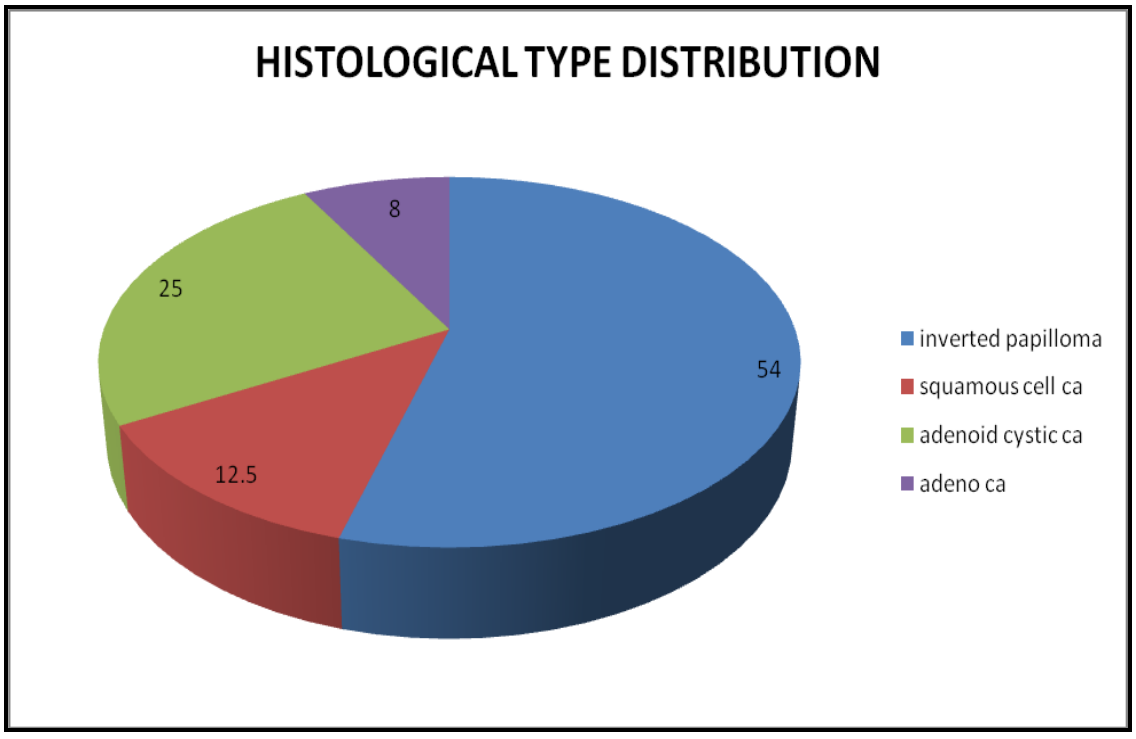
CO MORBIDITY DISTRIBUTION

S. No	Co-Morbidity	Ip	Sq cell ca	Adenoid cystic	Adeno	Total	Percent (for 24 patients)
1	Systemic hypertension	5	2	1	1	9	37.5
2	Diabetes	3	2	2	1	8	33
3	Bronchial asthma	1				1	4



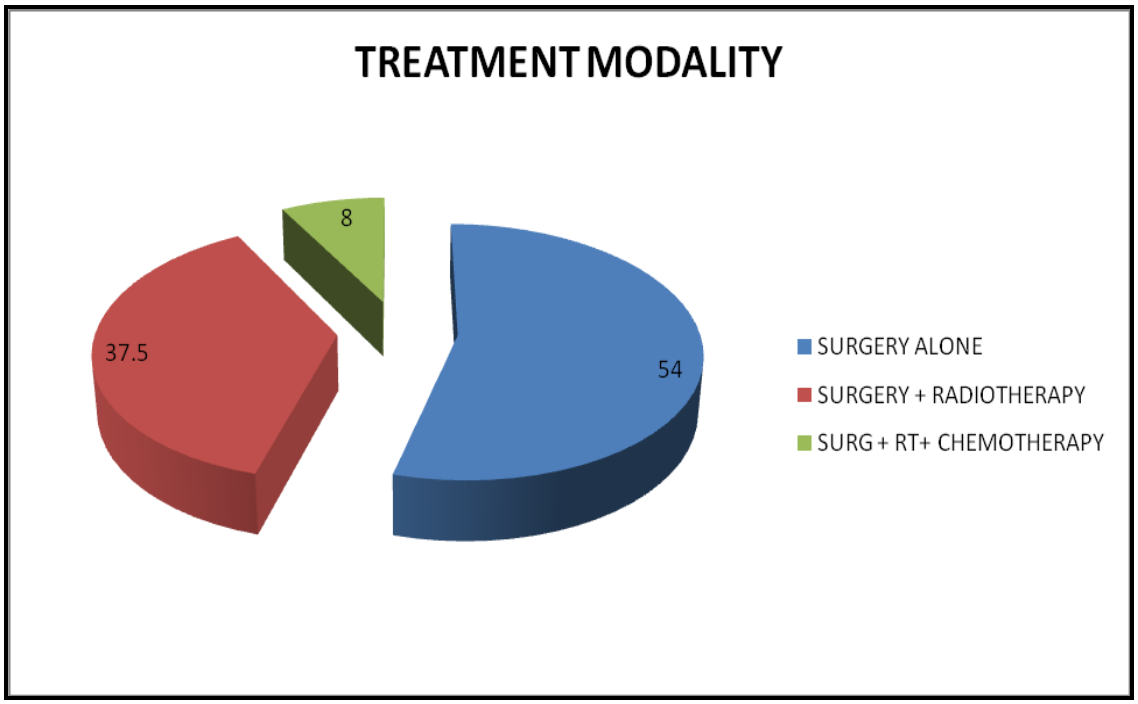
HISTOLOGICAL TYPES

S. No	Histological Tupe	Total	Percent
1	Inverted papilloma	13	54
2	Squamous cell ca	3	12.5
3	Adenoid cystic ca	6	25
4	Adeno ca	2	8
5	Total	24	100



TREATMENT MODALITY

S. No	Co-Morbidity	Ip	Sq cell ca	Adenoid cystic	Adeno	Total	Percent (for 24 patients)
1	Surgery Alone	13				13	54
2	Surgery + Radiotherapy		3	6		9	37.5
3	Surg + Rt+ Chemotherapy				2	2	8



OBSERVATION

A total of twenty four patients comprising of thirteen benign tumour patients and eleven malignancy patients were selected for the study. Minimum age group for benign tumour cases was eighteen and maximum was seventy five and for malignancy it was forty one and seventy five.

Nine patients in addition to the other clinical features presented with anemia and lose of weight . six patients had maxillary tenderness , one patient had maxillary swelling, there was neither no loosening or falling of teeth nor palatal anesthesia in any of the selected cases nor palatal anesthesia. The patient with external swelling had infra orbital anesthesia.

All the patient had medial wall of the maxillary sinus involvement, inaddition 27% of the patient with malignancy had inferior wall involvement, 18 % of the patients had anterior ethmoids involvement. The subsite involvement was preoperatively assessed with diagnostic nasal endoscopy which revealed the involvement of ethmoid and other adjacent sinuses, with CT scan and MRI in patients with adenoid cystic carcinoma , the opacification in the maxillary sinus was precisely differentiated into tissue or fluid , also the origin and the extention of the tumour.

Also CT scan analysis of the neck node involvement was done and one patient with squamous cell carcinoma had neck node metastasis. This also helped in the radiotherapy planning . None of the cases had retropharyngeal or other nodes.

We did endoscopic medial maxillectomy for all these twenty four patients.

The average duration of time for EMM for inverted papilloma was 2 hours and fifteen minutes anf three hours for malignancy is comparable with study made by Nader Sadeki et al.

The average blood loss was 150 ml for benign tumours and 300 ml for malignant tumours . None of the patients had more than one unit of blood transfusion.

The post operative hospital stay for all the inverted papilloma patients ranged from 4 days to 16 days on an average of 9 days . For malignancy the period of stay ranged from 10 to 16 days with an average of 11 days . Malignancy patients were discharged after confirming the negative margins in the histopathological report.

All the patients are followed from the day after surgery and the period of follow up averaged to 9 months (range – 1 month to 15 month) for inverted papilloma and 1 year for malignancy (range

of 7 months to 2 years). After one year of follow up one of the patient with adenoid cystic carcinoma developed recurrence in the same site.

The recurrence rate one patient for eleven patients which is nine %. Though it may appear huge but the study group is small to accurately comment . But with the recent review made by Osquthope et al the recurrence rate is 9% for benign tumours and 15 % for malignancy ,the results are comparable. Recurrence was confirmed and was proceeded to total maxillectomy and palliative radiotherapy followed. The patient is under surveillance since then.

Patients with inverted pailloma had a better healing with return of normal mucosa at an average of 3 months time interval was assessed by serial diagnostic endoscopy during follow up. Patients with malignancy were subjected to radiotherapy after six weeks of surgery . They had complete six weeks of RT and came for follow up. The return of mucosa to normal took an average of seven months. There was no incidence of bleeding or any other complication during radiotherapy or adjuvant chemotherapy.

During the follow up three patients with malignancy had initially complained of epiphora . None of the patient had atropic

rhinitis or any other severe complications during follow up. Two of the patient post radiotherapy had complained of anosmia which also improved during follow up.

The patients especially with malignancy also had routine nutrional consultation and they gained weight during follow up.

DISCUSSION

There are three principle aims in the excision of sinonasal tumour.

First, to create an adequate and sufficient exposure for complete excision. Secondly to provide an unobstructed view of post operative surveillance of the cavity. Thirdly to minimize the cosmetic and functional disabilities. These objectives are completely fulfilled by endoscopic medial maxillectomy.

Traditionally, maxillary sinus tumours have been treated with resection via lateral rhinotomy and medial maxillectomy. The procedure includes high morbidity in the form of external scarring, blepharitis, diplopia , intermittent dacryocystitis , facial neuralgia and sometimes CSF leak also with chance of recurrence requiring revision surgeries.

With endoscopic medial maxillectomy we use powered instruments and high definition camera television set up which gives unparalleled visualization , magnification of margins allowing resection of tumour completely with adequate margins . Multiple biopsies of the adjacent apparent normal areas were

taken and sent for Histopathology. Even unfavorable sites including inferior wall lateral wall and posterior wall can be visualized using angled endoscopes. The use of micro debriders and diamond burrs combined with endoscopes helps in removing the micro metastasis in the underlying bone.

In contrast to the external approaches, in endoscopic medial maxillectomy the normal sinonasal mucosa is preserved allowing normal physiological function and mucociliary clearance thus very little post operative complication .

A total of twenty four cases were operated by Endoscopic medial maxillectomy approach during the period of October 2012 to September 2014. The cases that were operated includes thirteen benign tumours and eleven malignant tumours. Benign tumours include thirteen cases of inverted papilloma. The malignant cases include six adenoid cystic carcinomas, three squamous cell carcinoma and two adeno carcinoma patients.

All the cases selected were of limited to early stages of malignancy and were done without compromising the oncological principles. The procedure was discussed with oncologist and

submitted to ethical clearance and with their concurrence early stages of malignancies has been included in the study.

Preoperative assessment of the tumour is essential to come to an idea of the attachment and extent of the tumour .All the patients pre operatively underwent tests which comprised of diagnostic nasal endoscopy , contast enhanced ct scan imaging of paranasal sinuses , magnetic resonance imaging, work up for metastasis which includes x-ray chest, ultra sonogram abdomen and neck , all bone and vertebra x-ray in suspected cases. Biopsy from the masses which were seen in anterior rhinoscopy was taken and sent for histopathological examination. With all these investigations the tumour grading was done , site of attachment was located and then planned for surgery.

Patients were counseled for the procedure and consent was obtained for both endoscopic medial maxillectomy and also total maxillectomy incases of malignancy supposing if it is difficult to give negative margins with the endoscopic procedure .

On the table, endoscopic medial maxillectomy done , the mass removed en bloc or was debrided, removed in toto and sent for histopathology. After dissection was over, the margins were

examined carefully , multiple biopsies were taken from the margins and sent for histopathology separately. In all the eleven malignancy patients the margins were free.

The malignant cases in addition to surgery, were subjected to post operative radiotherapy. The two adenocarcinoma patient had chemotherapy in addition as suggested by medical oncologist. One patient with adenoid cystic carcinoma had recurrence in the same site after one year, then underwent total maxillectomy. The repeat histopathological report was also inverted papilloma. Regular post operative follow up is essential to detect recurrence. The patients in the study are followed with endoscopic examination routinely and CT scan annually.

Studies have concluded that recurrence rates using endscopic medial maxillectomy are same or lower when compared to tradition procedures.

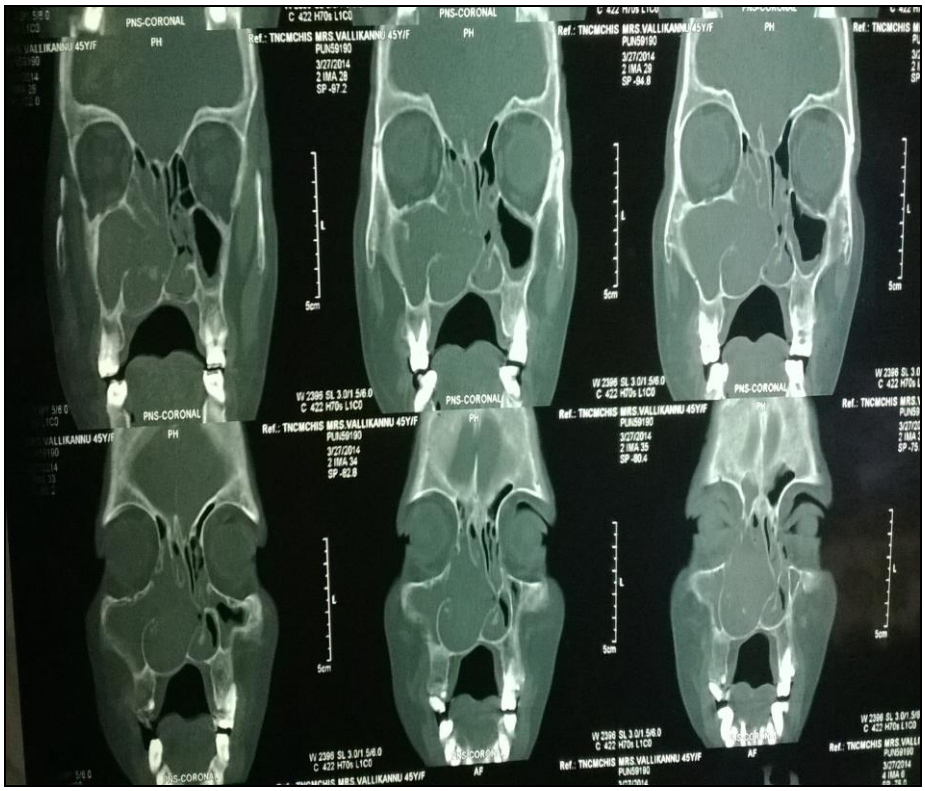
LIMITATIONS OF THE STUDY

- Early stages of malignancy alone (upto grade II of TNM staging) can be selected for endoscopic medial maxillectomy.
- The time period for my study is only two years , but ideally a five year follow up of all the cases individually is essential to comment on the success of the procedure
- The number of cases in the study is small and therefore it is difficult to predict the significance of the procedure.
- The procedure requires great skill of the surgeon and the ability to covert the endoscopic procedure to a radical procedure if needed.
- Patient compliance to follow up is the most important to identify early recurrence if any.

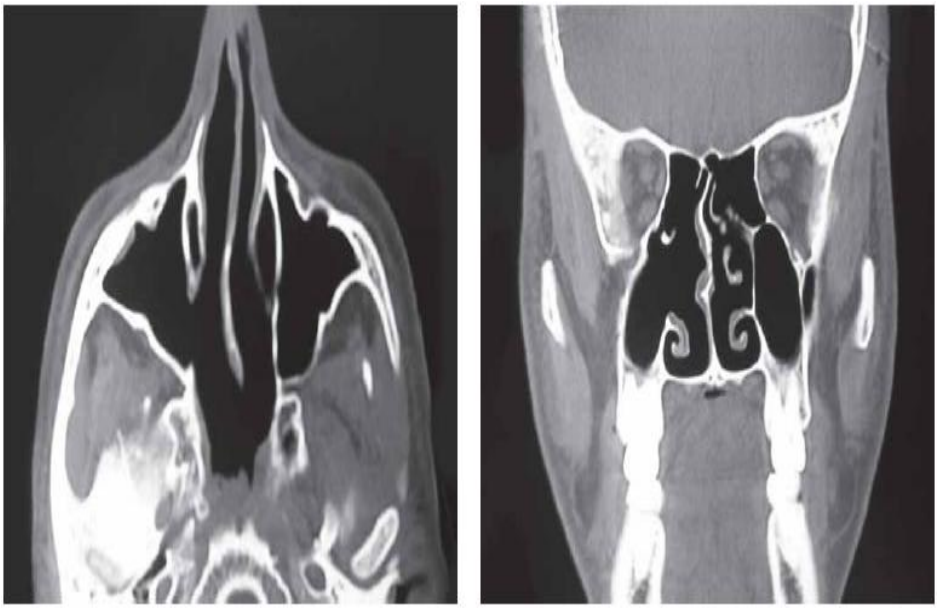
CASE FILES

INVERTED PAPILLOMA

PRE OPERATIVE CT SCAN

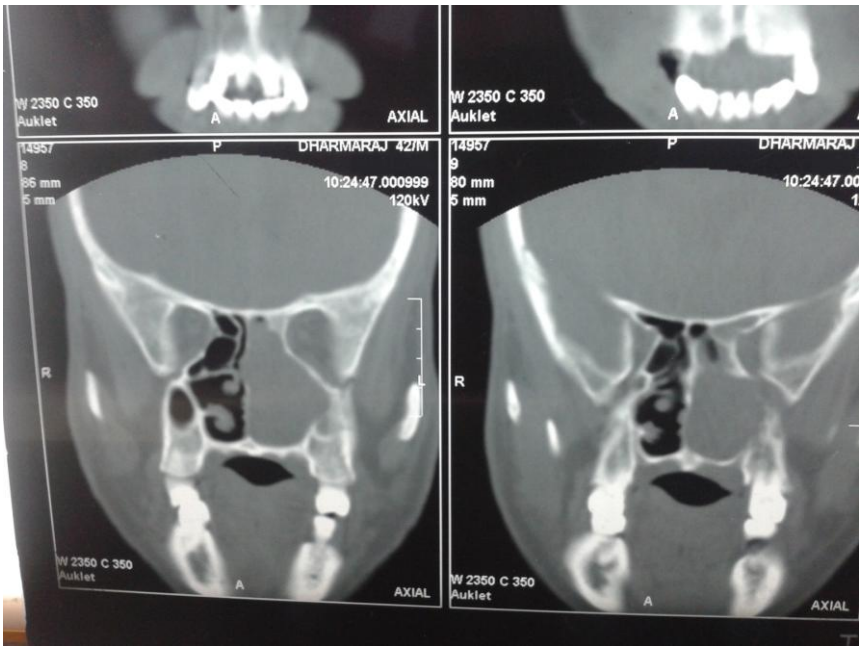


POST OP CT SCAN

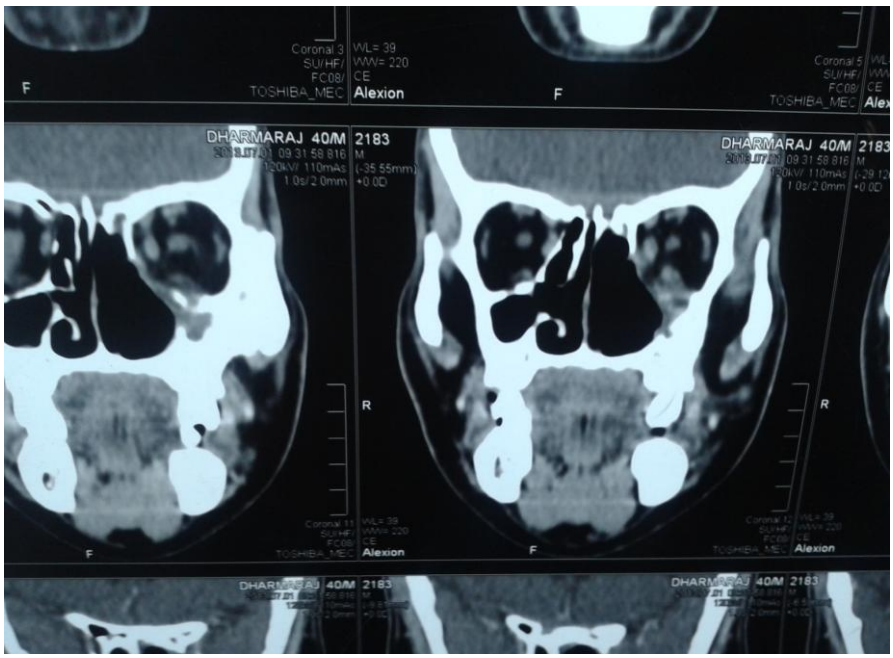


ADENOID CYSTIC CARCINOMA

PRE- OP CT SCAN



POST OP CT SCAN



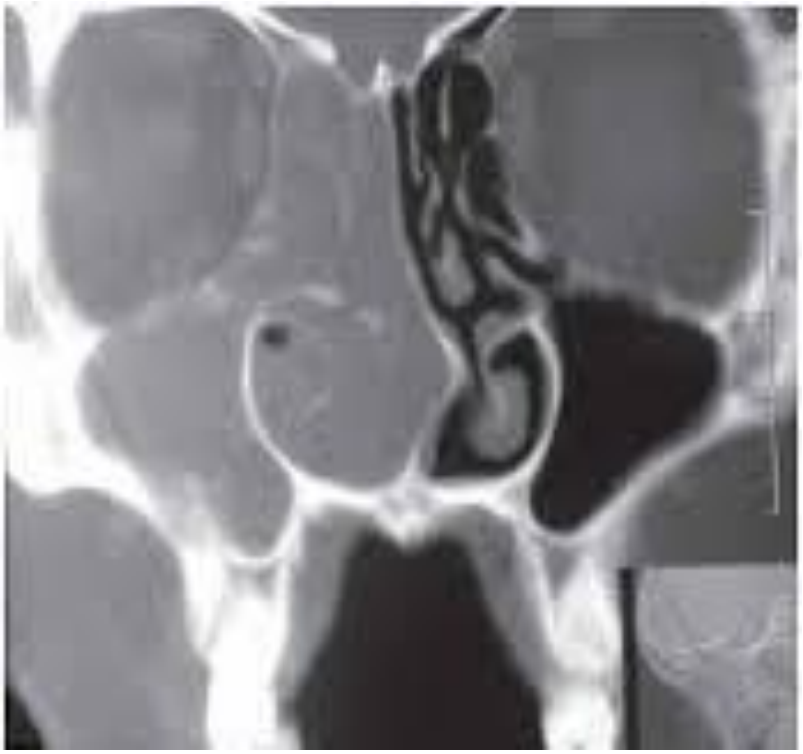
SQUAMOUS CELL CARCINOMA

PRE OP CT SCAN

POST OP CT SCAN

ADENOCARCINOMA

PRE OP CT SCAN



POST OP CT SCAN

CONCLUSION

Endoscopic medial maxillectomy is by far the best treatment for benign maxillary tumours of the medial wall especially the inverted papilloma. In this study early stage of malignancies of maxillary sinus has been included with good results.

Endoscopic medial maxillectomy is associated with minimum morbidity and is in accordance to oncological principles and preserves the normal physiology of nose and paranasal sinuses.

Endoscopic technique allows for direct visualization of the surgical site and hence precise localization of the pathological lesion and hence adequate especially for the posterior aspect of maxillary sinus adjoining ethmoid and frontal sinus with preservation of normal structure if possible, with an average same number or even lower recurrence as with external medial maxillectomy.

Cosmetically it is an excellent treatment for benign tumours for malignancies endoscopic medial maxillectomy offers best surgical approach in terms of tumour clearance and with minimal morbidity. The avoidance of scar and cosmetically better results

without compromising the oncologic principles is the main advantage.

The apparent reduction of hospital stay is a major point to be considered in favour of endoscopic medial maxillectomy for both patients and surgeons in the management of tumours of maxillary sinus.

Easy post operative follow up with diagnostic endoscopy as an office procedure also assists the surgeon to pick up early recurrence and treat more radically when needed.

However good results are dependent on appropriate patient selection who are also motivated to comply with regular post operative follow up.

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PROFORMA

Patient's Name	:	Hospital No.	:
Age	:	Date of admission	:
Sex	:	Date of surgery	:
Address	:	Date of discharge	:
Occupation		Contact No.	:
Religion	:		

CHIEF COMPLAINTS

1.

2.

3.

HISTORY OF PRESENTING ILLNESS

1. Nasal obstruction

   i) Duration

   ii) Unilateral / Bilateral

   iii) Sudden onset / insidious onset

   iv) Progressive / non progressive

   v) Complete / partial

   vi) Precipitating factor / relieving factor

   vii) Constant / intermittent

   viii) Seasonal variation

2. Nasal discharge

    i) Duration

    ii) Onset

    iii) Unilateral / Bilateral

    iv) Amount

    v) Watery / Mucoid / purulent / Mucopurulent / Blood stained / Crust

    vi) Continuous / intermittent

    vii) Foul smell

3. Sneezing

    i) Duration

    ii) No. of sneezing / episodes

    iii) No. of episode / day

    iv) Aggravating factor

    v) Relieving factor

4. Bleeding from the nose (Epistaxis)

    i) Duration

    ii) Sudden / insidious

    iii) Intermittent / continuous

    iv) No. of episodes / day

    v) History of trauma – present / absent

    vi) Associated nasal discharge

    vii) Associated mass

5. Headache
    i) Duration
    ii) Onset
    iii) Unilateral / Bilateral / generalised / frontal / facial
    iv) Severity – affect daily activity / keep awake at night
    v) Character - Throbbing / dull / intense
    vi) Associated with – visual disturbance / dizziness / vomiting
    vii) Precipitating factors
    viii) Relieving factor
6. Swelling / deformity of the nose
    i) Duration
    ii) Onset
    iii) Any other associated symptoms
7. Disturbance of smell
    i) Duration
    ii) Onset
8. Change in voice
    i) Duration
    ii) Nasal twang
    iii) Hypernasality
    iv) Hyponasality

9. Fever

   i) Present / absent

   ii) Intermittent / remittent / continuous

   iii) Mild / moderate / severe

   iv) Diurnal variation

   v) Chills and rigor – present / absent

10. Hearing impairment

11. Duration

   i) Unilateral / bilateral

   ii) Continuous / intermittent

   iii) Fluctuation

   iv) Progression

12. Neck swelling

13. Any other complaints

PAST HISTORY

i) Tuberculosis

ii) Diabetes Mellitus

iii) Hypertension

iv) Asthma

v) Previous ENT surgery

vi) Drug allergy if any

vii) Epilepsy

viii) Previous hospitalization

ix) History of facial trauma

FAMILY HISTORY

PERSONAL HISTORY

i) Diet

ii) Appetite

iii) Sleep

iv) Bowel and bladder

v) Consumption of alcohol

vi) Smoking

vii) Chewing habit

viii) Socio-economic condition

GENERAL PHYSICAL EXAMINATION

i) Built

ii) Nourishment

iii) Pallor

iv) Icterus

v) Clubbing

vi) Cyanosis

vii) Lymphadenopathy

viii) Edema

ix) Blood pressure

x) Pulse rate

xi) Respiratory rate

xii) Temperature

SYSTEMIC EXAMINATION

i) Cardiovascular system

ii) Respiratory system

iii) Central nervous system

iv) Per abdomen

ENT EXAMINATION

I) External nose

i) Inflamed / noninflammed /

ii) Redness

iii) Scar

iv) Sinus – congenital / dermoid / acquired / not present

v) Swelling – Present / not present

vi) Appearance of nose

vii) Destruction of nose – trauma / cancer / syphilis

II) Vestibule

i) Inflammation – present / absent

ii) Fissure

iii) Crust

iv) Septal deviation

v) Swelling

III) Sinus tenderness

Maxillary

Frontal

Ethmoidal

IV) Anterior rhinoscopy

i) Cavity – roomy / narrowed

ii) Septal deviation

iii) Turbinate hypertrophy

iv) Discharge in meatus

v) Septal deviation

vi) Lateral wall mass – present / absent

vii) Mucosa

viii) Floor of nose

ix) Roof – seen / not seen

V) Cold spatula test

VI) Posterior rhinoscopy

VII) Mass

i) Size

ii) Shape

iii) Surface

iv) Site of attachment

v) Colour

vi) Consistency

vii) Mobility

viii) Sensitivity

ix) Bleeding on probe – present / absent

VIII) Probe test

IX) Neck examination

X) Cranial nerve examination

XI) Ear examination

Right
Left

Pinna

Preauricular

Post auricular

EAC

Tympanic membrane

Middle ear mucose if seen

Fistula sign

Tuning fork test

Rinnie’s test

Weber test

ABC test

Fistula sign

XII) Diagnostic nasal endoscopy

XIII) Oropharyngeal examination

XIV) IDL examination

Provisional diagnosis

Differential diagnosis

INVESTIGATIONS

i) HB %
ii) TC
iii) DC
iv) Blood grouping and typing
v) ESR
vi) RBS
vii) Bleeding time
viii) Clotting time
ix) PT
x) PTT
xi) Platelet count
xii) HBsAg
xiii) HIV I & II
xiv) RBS
xv) S. creatinine
xvi) Blood urea
xvii) VDRL

X-RAY findings

CT Scan findings

MRI findings

Histopathological examination findings

DIAGNOSIS

TREATMENT

i) Name of surgical procedure

ii) Site of operation

iii) Duration

iv) Anaesthesia

v) Surgury details

vi) Operative findings

POST-OP

i) Post-op instructions

ii) First post-op checkup

iii) Second post-op checkup

iv) Third post-op checkup

v) Discharge - Date Time

FOLLOW-UP :

i) First week

ii) Second week

iii) Third week

iv) Fourth week

v) 2^{ND} month

s. no:	ip. No:	age	gender	socio economic status	complaints	duration of onset of symptoms in months	co morbidity	personal history	general examination	cold spatula test	anterior rhinoscopy	posterior rhinoscopy	maxillary sinus	neck	ct scan	dne	hpe	TUMOUR staging	treatment	post operative hospital stay in days	follow up period in months	follow up2	recurrence
1	41517	70	F	LL	L-OMBASw	18	NS	C	P+	AL	M	N	N	N	MEF	+	IP	T3	S	4	4	U	N
2	78104	22	F	LM	R-ODAw	3	NS	N	P-	AR	M	N	N	N	MEF	+	IP	T2	S	4	7	U	N
3	85140	18	M	UM	R-OAMw	2	H	S	P-	DR	M	N	N	N	ME	+	IP	T2	S	4	1	U	N
4	65049	54	M	LM	R-OADw	6	NS	SA	P-	AR	M	N	N	N	ME	+	IP	T1	S	4	2	U	N
5	57157	40	F	UL	R-OBHAw	4	NS	N	P+	AR	MD	N	N	N	ME	+	IP	T3	S	13	14	U	N
6	79053	50	F	LL	R-OBAw	8	H	C	P+	AR	MD	N	N	N	ME	+	IP	T3	S	7	13	U	N
7	92552	27	F	LL	R-Odw	4	B	N	P-	AR	M	N	N	N	ME	+	IP	T2	S	10	11	U	N
8	97981	57	F	LL	R-OABw	7	DH	C	P+	AR	MD	N	N	N	MEF	+	IP	T3	S	4	11	U	N
9	88854	75	M	UL	L-OBAMw	12	H	SA	P-	AL	MD	N	N	N	MEF	+	IP	T2	S	16	13	U	N
10	60634	46	M	UL	R-Oaw	3	NS	SA	P-	AR	M	N	N	N	ME	+	IP	T2	S	11	10	U	N
11	72839	50	M	UL	R-OAw	3	HD	SA	P+	AR	M	N	N	N	ME	+	IP	T2	S	16	10	U	N
12	52488	58	M	UL	L-OA	2	NS	SA	P+	AR	M	N	N	N	ME	+	IP	T2	S	15	12	U	N
13	89321	75	F	LL	L-OBAM	5	HD	C	P-	AR	M	N	N	N	ME	+	IP	T3	S	12	15	U	N
14	85571	41	F	UL	L-OH	3	NS	S	P+	E	M	N	T	N	M	+	ADC	T2	SRT	13	12	U	N
15	9861	55	M	LL	R-OB	4	D	SA	P-	DR	MD	N	N	N	M	+	ADC	T2	SRT	11	8	U	N
16	21221	70	F	LL	L-OBD	6	DH	C	P+	AL	M	N	T	N	ME	+	ADC	T1	SRT	13	15	U	N
17	21174	40	M	UL	R-OB	3	NS	SA	P-	DR	M	N	N	N	ME	+	ADC	T2	SRT	12	6	U	N
18	47556	42	M	LL	L-O	5	NS	SA	P-	DL	M	N	N	N	M	+	ADC	T1	SRT	12	24	U	N
19	34192	65	F	LL	L-OBD	11	D	C	P-	AL	MD	N	T	PL	ME	+	SQ	T2	SRT	11	12	U	N
20	5128	58	F	UL	L-OB	6	H	S	P-	DL	MD	N	T	PL	M	+	SQ	T1	SRT	15	7	U	N
21	23672	70	M	LL	L-OBDHN	3	HD	SA	P-	AL	M	N	N	N	M	+	SQ	T1	SRT	12	9	U	N
22	98827	55	f	UL	R-ODA	18	NS	N	P+	DL	M	N	TS	N	M	+	ADC	T2	SRT	10	12	Recurrence after one year	total maxillectomy + palliative chemort
23	104178	55	F	LM	L-O	3	D	N	P+	AL	M	N	T	PL	M	+	AD	T2	SRTC	11	10	U	N
24	98672	46	M	LM	L-O	5	DH	S	P-	AL	M	N	T	PL	M	+	AD	T2	SRTC	10	11	U	N

KEY TO MASTER CHART

1) Serial number

2) O.P/I.P Number

3) Age in Years

4) Sex M-Male F-Female

5) Socioeconomic status

LL – Lower lower UL- Upper lower

LM- Lower middle UM- Upper middle

6) Chief complaints R- Right L- Left

O-Nasal obstruction S-Swelling

B-Bleeding from nose H-Headache

A- Altered sense of smell M-Mass in the nose

W- Watering of Eyes N- Neck Node

7) Duration since onset of the first symptom in months

8) Past history D- Diabetes mellitus

H- Hypertension TB -Pulmonary tuberculosis

NS- Nothing significant

9) Family history

10) Personal history

S- Smoking C- Tobacco chewing

A- Alcoholic SN-Snuff

11) General physical examination

P+ Pallor present P- Pallor absent

12) External appearance of nose

F- Fullness N- No abnormality detected

13) Cold spatula test DL- Decreased fogging on left side

DR- Decreased fogging on right side DB- Bilateral decreased fogging

AL- Absent fogging on left side AR- Absent fogging on right side

14) Anterior rhinoscopy

M-Mass N-Normal DR- DNS to right

DL- DNSto left DG- Discharge

15) Posterior rhinoscopy

M- Mass N-Normal

16) Maxillary sinus N-Normal

T-Tenderness S-Swelling

17) Neck N- Normal PL-Palpable neck node

18) CT scan regions involved

M- Maxilla E-Ethmoids F- Frontal sinus

S- Sphenoid sinus

I-Intracranial extension O- Orbital extension

P-Pterygopalatine fossa T- Infratemporal fossa

19) Diagnostic nasal endoscopy

+ Evidence of disease

- No evidence of disease

20) Histopatholgy

Sq- Squamous cell carcinoma IP- Inverted papilloma

AD- Adeno carcinoma ADC –adenoid cystic carcinoma

21) T –staging

22) Treatment modality

S – surgery alone SRT – surgery + radiotherapy

SRTC- surgery + rt + chemo

23) Follow up R- Recurrence

D- Death C-CSF rhinorrhoea U- Uneventful

24) Treatment for recurrence

S- surgery RT-Radiotherapy C- Chemotherapy

PATIENT CONSENT FORM

Title of the Project : **"ENDOSCOPIC MEDIAL MAXILLECTOMY FOR MAXILLARY SINUS TUMORS: INDICATIONS AND CLINICAL OUTCOME"**

Institution :Upgraded Institute of Otorhinolaryngology,
Madras Medical College,
Chennai – 600003.

Name :
Age :
Sex :

Date :
IP No. :
Project Patient No. :

The details of the study have been provided to me in writing and explained to me in my own language.

I confirm that I have understood the above study and had the opportunity to ask questions.

I understood that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without the medical care that will normally be provided by the hospital being affected.

I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

I have been given an information sheet giving details of the study.

I fully consent to participate in the above study.

Name of the subject	Signature	Date
Name of the Investigator	Signature	Date

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. Vijay Nivas .A,
PG in Otorhinolaryngology,
Upgraded Institute of Otorhinolaryngology,
Madras Medical College, Chennai-3.

Dear Dr. Vijay Nivas .A,

The Institutional Ethics Committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled **"Endoscopic Medial Maxillectomy for Maxillary Sinus Tumors: Indications and Clinical Outcome"** No.16032014

The following members of Ethics Committee were present in the meeting held on 11.03.2014 conducted at Madras Medical College, Chennai-3.

1.	Dr. C. Rajendran, M.D.	-- Chairperson
2.	Prof. Kalaiselvi, MD Vice-Principal, MMC, Ch-3	-- Member Secretary
3.	Prof. Nandhini, M.D. Inst. of Pharmacology, MMC, Ch-3.	-- Member
4.	Prof. Bhavani Shankar, M.S. Prof & HOD of General Surgery, MMC, Ch-3.	-- Member
5.	Prof. V. Padmavathi, M.D. I/c Directory of Pathology, MMC, Ch-3.	-- Member
6.	Thiru. S. Govindasamy, BABL	-- Lawyer
7.	Tmt. Arnold Saulina, MA MSW	-- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/Chairman & Other Members

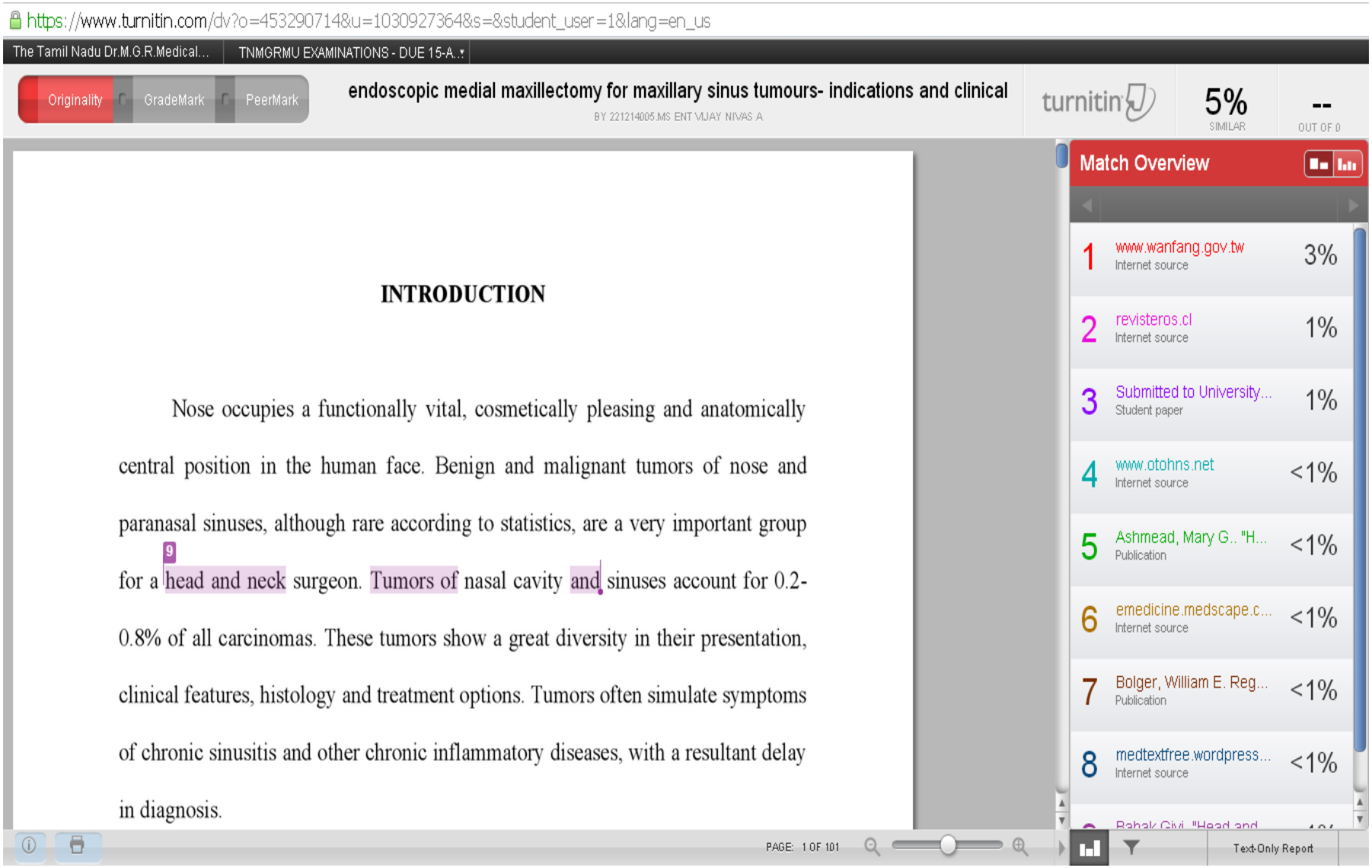
The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

20/3/14

MEMBER SECRETARY
MADRAS MEDICAL COLLEGE

Member Secretary, Ethics Committee

20/3/14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INTRODUCTION
Nose occupies a functionally vital, cosmetically pleasing and anatomically central position in the human face. Benign and malignant tumors of nose and paranasal sinuses, although rare according to statistics, are a very important group for a head and neck surgeon. Tumors of nasal cavity and sinuses account for 0.2-0.8% of all carcinomas. These tumors show a great diversity in their presentation, clinical features, histology and treatment options. Tumors often simulate symptoms of chronic sinusitis and other chronic inflammatory diseases, with a resultant delay in diagnosis.
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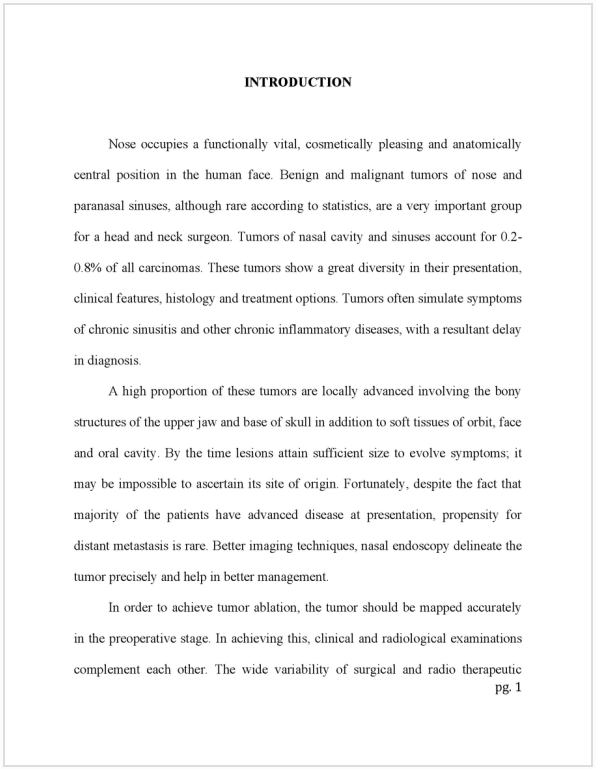

INTRODUCTION

Nose occupies a functionally vital, cosmetically pleasing and anatomically central position in the human face. Benign and malignant tumors of nose and paranasal sinuses, although rare according to statistics, are a very important group for a head and neck surgeon. Tumors of nasal cavity and sinuses account for 0.2-0.8% of all carcinomas. These tumors show a great diversity in their presentation, clinical features, histology and treatment options. Tumors often simulate symptoms of chronic sinusitis and other chronic inflammatory diseases, with a resultant delay in diagnosis.

A high proportion of these tumors are locally advanced involving the bony structures of the upper jaw and base of skull in addition to soft tissues of orbit, face and oral cavity. By the time lesions attain sufficient size to evolve symptoms; it may be impossible to ascertain its site of origin. Fortunately, despite the fact that majority of the patients have advanced disease at presentation, propensity for distant metastasis is rare. Better imaging techniques, nasal endoscopy delineate the tumor precisely and help in better management.

In order to achieve tumor ablation, the tumor should be mapped accurately in the preoperative stage. In achieving this, clinical and radiological examinations complement each other. The wide variability of surgical and radio therapeutic

pg. 1